

Antiquity

VOL. XV No. 59

SEPTEMBER 1941

Ancient Harbours*

by SIR LEOPOLD HALLIDAY SAVILE, K.C.B.

SHIPBUILDING and harbour engineering are two of the oldest branches of our profession as Civil Engineers. It is well established that before 3300 B.C. the Egyptians built sea-going ships and that they made voyages to far lands to procure iron, lead, silver and other materials; and it is recorded on the Palermo stone that about 3000 B.C. king Seneferu built sixty great ships to go to the Syrian coast to bring cedar-wood for his works. In the British Museum is a stone statue of Bedja, son of Ankhu, one of the great shipbuilders of his days. The terminus of these voyages was on the Canopic branch of the Nile, where was situated A-ur or the Great Door, which Mr P. E. Newberry calls 'an ancient Alexandria of a period earlier than 3000 B.C.' Little is known about this harbour, except that Narmer, one of the earliest kings of the First Dynasty, considered it of great importance and decided to conquer the petty kingdom of Harpoon, to which it belonged. It was an inland port and probably had the disadvantages of that type, especially as it lay on the banks of an arm of the delta. The actual site of the port is not known, but I refer to it because it is the earliest harbour of which I have found mention and because it marks the beginning of the harbour of Alexandria, which, I think, has the longest history of any harbour in the world. I propose to devote some of my article to a study of the great schemes adopted on the Alexandrian site over a period of nearly 5000 years (FIG. 1). There have been four distinct harbour building periods—the harbour of A-ur, about 3000 B.C.; the great harbour of Pharos, soon after 2000 B.C.; the harbour of Alexander

*The Editors of ANTIQUITY are indebted to Sir Halliday Savile for permission to reprint his presidential address to the Institution of Civil Engineers and to the Institution for the use of the plans and other illustrations.

ANTIQUITY

the Great, begun in 332 B.C. ; and the modern harbour, which dates from A.D. 1870.

The Great Harbour of Pharos (FIG. 2) was typical of the pre-hellenic form of massive structure, far more massive than some of the great harbours of modern times, and it is well worth study. Its layout and the skilful use made of the configuration of the bed of the sea might have been the work of a modern harbour engineer. 'When', says M. Gaston Jondet, 'one examines the largeness of the project and ponders on the boldness of its execution, it becomes obvious that it was conceived by a sovereign power of unequalled breadth of view, a realistic genius capable of conquering and keeping the mastery of the Mediterranean sea'. Who the realistic genius was we do not know, for Egyptian history, curiously enough, has no record of this harbour. M. Raymond Weill attributes both its conception and its construction to the Minoan Cretans, who at that time were the greatest sea-faring power in the Mediterranean. It could not, however, have been made without the co-operation of the reigning Pharaoh, possibly Sensusret of the Twelfth Dynasty, a famous builder of colossal buildings typical of the Egyptian, Minoan, and Mycenaean civilizations of those early times. This gives us a date somewhere between 2000 and 1800 B.C.

The harbour was based at its eastern end upon the island of Pharos, and at its western on the rock of Abu Bakar. It also took advantage of the submerged ridge running from Marabout point to the north of Pharos, and of the shelf which sloped from this towards the deep sea. From the bay of Ras el Tin at the western end of Pharos to the Abu Bakar rock there is a deep pool, bounded on its northern edge by the submerged ridge. It was by surrounding this pool with breakwaters and piers that the great inner basin was formed. Seawards of this another series of breakwaters, using the outer edge of the shelf, enclosed the outer basin. The two basins together formed a magnificent harbour about 300 acres in extent.

The entrance to the harbour was on the south, and the approach channel crossed the submerged ridge by the *Passe des Corvettes* between the Ikvan and El Dublan rocks. Between these rocks, the southern boundary of the harbour, and the island of Pharos, not then joined to the mainland of Egypt, was a sheltered roadstead for ships making the entrance against the prevailing northwest wind.

I will now try to give some idea of the construction of the works. On the right the entrance is flanked by a slightly-curved landing-quay (FIG. 3) running in a northeast-southwest line, founded on a firm mass

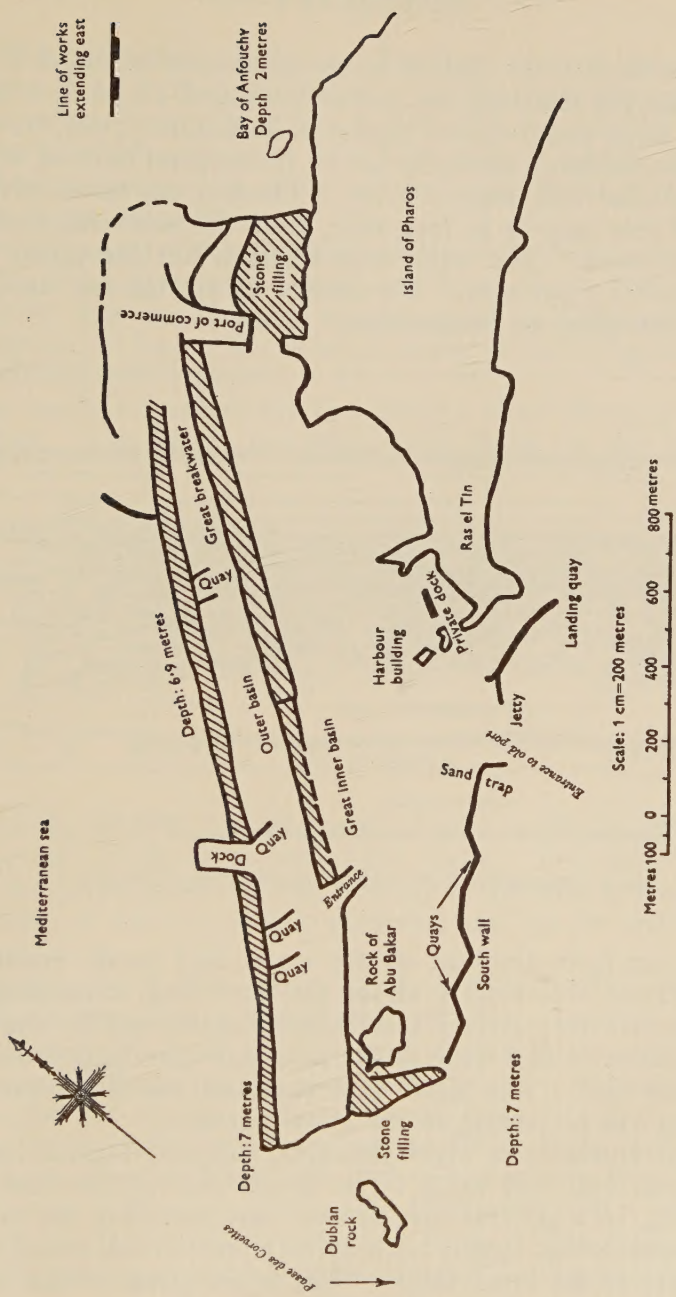


FIG. 2. PRE-HELLENIC PORT OF PHAROS

ANTIQUITY

of argillaceous sand in the shallow water off the end of Ras el Tin point. This quay was 525 feet long by 46 feet wide and 18–20 feet high, and was built of large rough-hewn blocks of limestone from the quarries at Mex on the mainland, carefully laid in courses and bonded with small aggregate and sand well tamped down. The top was paved with pentagonal flags 26 feet long by 23 feet wide, all of the same shape and forming a chequer-work. The walls were vertical, but the upper surfaces had a gradient of 3 per cent. No cement or mortar was used on this or on any of the quays or breakwaters.

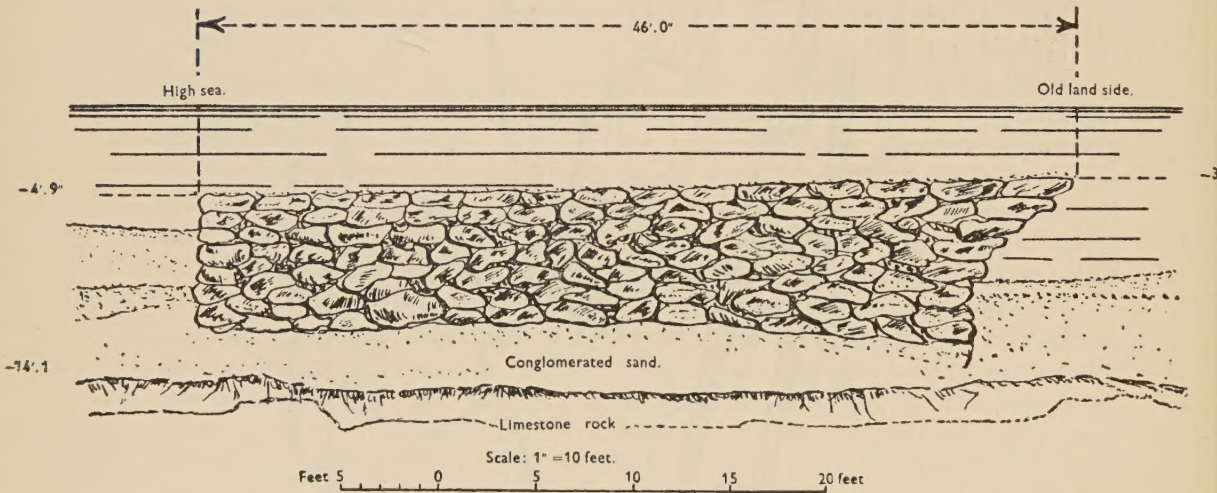


FIG. 3. CROSS-SECTION OF LANDING QUAY, PORT OF PHAROS

Jutting out from the end of this quay, and partly enclosing the harbour entrance, was a jetty about 426 feet long, consisting of two parallel walls just over 41 feet apart, closed at the end by a cross-wall. These walls were $7\frac{1}{2}$ feet wide at the top, and were built with a slight batter on each face. The space thus enclosed was filled with rubble and sand, and had no paving on the upper surface.

The main entrance, of which this quay and jetty formed the eastern protection, was 650 feet wide. The south wall of the harbour was 2300 feet long, in a general east to west direction, but its course was irregular because it was largely built up on a line of reefs which bordered the deep water of the inner basin. The upper parts of this wall were built of large, carefully-hewn blocks ranging from 8 feet to 16 feet in

ANCIENT HARBOURS

length, laid with great precision. Again no cement was used, but the joints were filled with small stones. At the main entrance end of the wall was a short protective mole or spur, 360 feet long by 65 feet wide, the object of which appears to have been to form a sand-trap to prevent the drift of sand caused by the south and west winds from blocking the entrance to the harbour.

The pavement of the southern wall is of interest because its pattern is typical of the pavements found in Minoan Crete and lends support to the view that the harbour was the work of Cretan engineers. It was composed of large slabs of stone, many 16 feet long, laid so that the joints radiated from a centre.

The southern wall ended at a point a short distance southwest of Abu Bakar. Thence ran two walls, each about 490 feet long, one in a

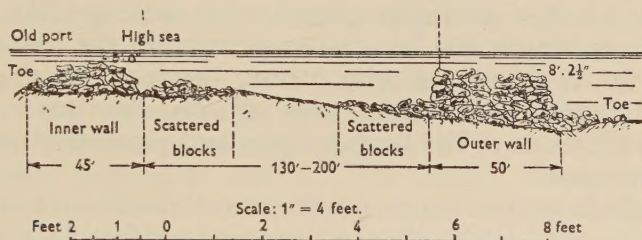


FIG. 4. TYPICAL SECTION OF GREAT BREAKWATER,
PORT OF PHAROS

north and the other in a northwest direction, enclosing between them a triangular area of about 28,000 square yards. This space was filled in by large blocks of limestone and formed an immensely powerful breakwater, much of which is still in existence and can be seen under water on a clear day.

The most marvellous works of this harbour were, I think, the two great breakwaters that guarded the inner basin and the outer basin. The first, which M. Jondet called the great breakwater, started from the northern end of the triangular mass just referred to and ran for 8500 feet in a straight line to the western end of Anfouchy bay. For its first 2000 feet it was built in the same way as the southern wall, except that the part bordering the Abu Bakar rock seems to have been filled in with dumped stone to form a solid mass. Then followed a length of 6500 feet which needed to be very strongly made. Two walls, founded on firm argillaceous sand overlying the submerged ridge already mentioned, were built 130-200 feet apart (FIG. 4). Each ranged in width at its

ANTIQUITY

upper surface from 26 feet to 40 feet, and had a batter of 1 in 30, and each was protected by a substantial toe. Their height, judged from the remains that have been found under water, appears to have ranged from 20 to 30 feet. The depth of water in the basin is unknown, but it may be estimated at 25-40 feet, with considerably deeper patches in the pool of Ras el Tin. The walls were built of enormous blocks of stone roughly hewn and coarsely laid. All of the space between the walls was filled with large blocks, forming a surface between 180 feet and 250 feet wide. The great width would enable defending parties to move rapidly to any part of the harbour during piratical attacks, whilst in normal times it was useful for drying and repairing sails and fishing-nets, weaving ropes, and so forth.

Running parallel to this breakwater, and about 650 feet distant from it, was another of similar construction enclosing the outer basin, the entrance to which was by a passage through the inner breakwater a little to the northeast of Abu Bakar, between its single-wall and double-wall portion. Protection was afforded by two moles running in the same direction as the landing-quay and protective mole guarding the main entrance.

The whole of the inner breakwater formed an immense quay. Besides this, several jetties about 60 metres (197 feet) long ran out from the outer breakwater, and nearly the whole of the south wall of the inner basin formed a broad quay, giving a total length of quay of about 10,000 feet. There was also a kind of dock built out seawards from the outer breakwater, the purpose of which is not clear. It may have been another entrance to the harbour.

The remains at the eastern end of the harbour bordering on Anfouchy bay are not so easy to interpret. About 650 feet from its end the great breakwater of the inner harbour was pierced by an opening 160 feet wide and 525 feet long, to form what M. Jondet calls the commercial harbour. This small port had two entrances, one from the outer basin, and one direct from the sea, carefully protected by two incurving breakwaters. Beyond the commercial harbour the great breakwater continued for a short distance to the shallow water at the commencement of Anfouchy bay, where a north and south cross-wall closed the harbour. A very large area between the breakwater, the wall, and the shore of the island was filled in with large stone blocks, as at the west of Abu Bakar.

At the extremity of the point of Ras el Tin, near the main entrance to the inner basin, is a small island around which are the remains of

ANCIENT HARBOURS

other works, including a short mole which enclosed a small private dock—perhaps for the use of craft owned by the harbour authorities. This surmise is made the more probable by the fact that slightly to the northwest are the submerged ruins of a large building, more than 92 feet long by 46 wide, with approach channels and steps, which appear to have been the headquarters of the port management, where pilots and the captains of ships would come to receive their orders.

To the east of the great harbour was a smaller one occupying the bay of Anfouchy. It also was protected by breakwaters and equipped with quays, but it afforded only a shallow depth of water and was used chiefly as a fishing-centre.

I have attempted to give a brief description of the ancient harbour of Pharos, as revealed by the researches of M. Gaston Jondet, carried out between 1910 and 1915; and when the science shown in its layout and construction is considered, we must, I think, agree with him that it was, indeed, the work of a realistic genius.

It may seem strange that when Alexander the Great founded Alexandria and built his harbour in 332 B.C. he should have taken no notice of these wonderful works. The reason was that they had disappeared under the sea, and all that marked the site of the future city was a little village at Rhacotis and a small colony of fishermen. There is no more record of its fall than of its rise. Homer may refer to it in the fourth book of the 'Odyssey', where he describes Pharos as an island in the troubled sea having within it a haven with fair moorings. If this is so, then its decline must be dated some time after 1000 B.C.

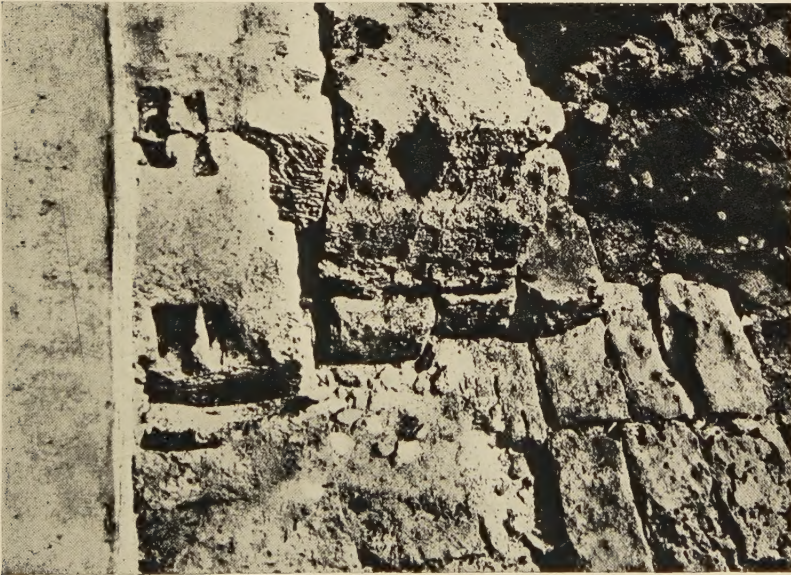
A few words as to the cause of its disappearance may be interesting, although 'disappearance' is really a misnomer, because, as M. Jondet has shown, a very large portion of the works still exists and on a calm day parts of them can be seen clearly below the surface of the sea. The ridge of high ground upon which the harbour was built is formed of limestone similar to that exposed in the quarries of Mex. Overlying the slopes of this ridge is a thin layer of clay, upon which is a thick layer of river silt in various states of consolidation. Covering this on the higher slopes is the stratum of hard argillaceous sand, and it was upon this that the walls and breakwaters were built. M. Jondet considers that, as the silt consolidated, its bearing value weakened and the stratum of sand which rested upon it glided down the slopes in sudden subsidences, the underlying clay acting as a sliding surface. The process was purely mechanical, although earth tremors may at times have started the movement. In this manner whole portions of the

ANTIQUITY

works glided below water-level, often without any damage to their structure.

Fifteen hundred years after the foundation of the harbour of Pharos, Alexander the Great, returning down the Canopic branch of the Nile from his visit to the temple of Zeus Ammon in the oasis of Siwah, halted at the village of Rhacotis. Ever since his destruction of Tyre he had determined to build a harbour that should be her rival. At Rhacotis he had found the place he wanted. He, himself, is said to have traced the plan of Alexandria and its harbour, which his famous engineer, Dinocrates, was ordered to carry out (FIG. 5). The main feature of the harbour was the great mole, 600 feet wide and 7 *stadia* (about 1 mile) in length, and hence called the *Heptastadion*, from the mainland to the island of Pharos, which divided the roadstead into two basins. It was built in a depth of water of 36 feet, and its construction entailed the excavation, transport, and deposition of about two million cubic yards of stone. The basin on the right of the mole formed the Great Harbour, and that on the left the *Eunostos* or Haven of Happy Return. Two openings through the mole connected them, thus conforming to the ancient rule that a harbour should have two entrances. The Great Harbour was bounded by the Lochias headland, the *Heptastadion*, and the eastern end of the island of Pharos. Seaward it was protected by a pier built out from Lochias and by a line of dangerous reefs, which made entrance to the harbour difficult. It was chiefly to remedy this that Ptolemy built the world-famous Pharos, or lighthouse, one of the seven wonders of the world, on the eastern point of the island. Alexander erred in putting his harbour in this place, since the depth of water was not so good as in the neighbouring haven, the reefs and Lochias pier did not provide sufficient protection against the winds, and the entrance was always difficult. Within the Great Harbour lies the small island of Antirrhodus, and between it, the mainland, and Lochias was formed a small *Portus Regius*, or Port Royal, for the king's ships. Between the *Portus Regius* and the *Heptastadion* the shore was lined with quays and storehouses. The public granaries were on the *Eunostos*, where also was a small inner harbour enclosed by piers. It was on this basin that the important canal connecting the harbours with lake Mareotis and the Nile, by its Canopic branch, opened. Alexandria partially fulfilled its founder's purpose of crippling the trade of Tyre; but this was due to the policy of Ptolemy Philadelphus (285-247 B.C.) who made a harbour at Berenice on the Red Sea, connected it with Coptos, on the Nile, by a road provided with water-places at proper stages, and reopened the

PLATE I



FOUNDATIONS OF THE MOLES OF THE SIDONIAN HARBOUR (see p. 220)

PLATE II



FOUNDATIONS OF BREAKWATER AT TYRE (see p. 221)

ANCIENT HARBOURS

canal between the Nile and the Red Sea at Suez. Thus he captured for Alexandria the important trade of the Indian Ocean and the Red Sea, which had hitherto passed by Eloth and Eziongebir to the coasts of Palestine, whence it was carried in Tyrian ships over the whole of the then known world. Alexandria's gain was Tyre's loss.

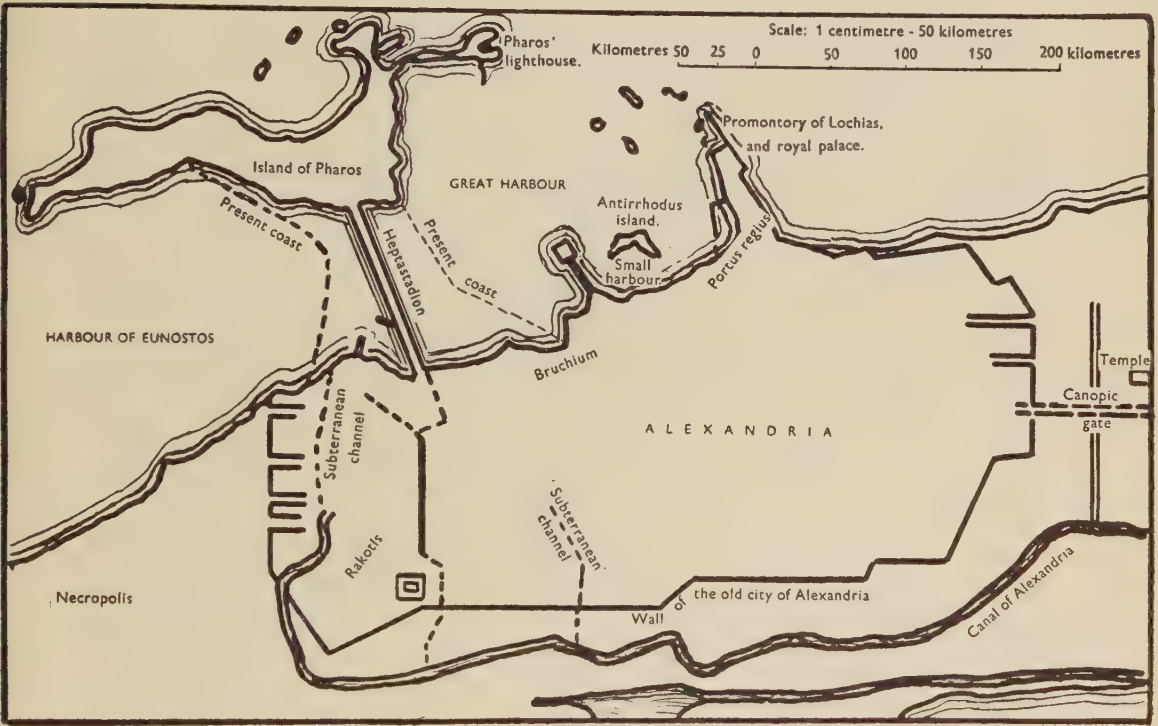


FIG. 5. PLAN OF ALEXANDRIA AND ALEXANDER'S HARBOUR, 332 B.C.

A period of more than 2000 years passes (FIG. 1). In the meantime the sand, which the engineers of ancient Pharos had been so careful to fend from the entrance to their harbour, had passed along the roadstead and had been caught up by the *Heptastadion*. Gradually it broadened until it formed that belt between the waters upon which a large portion of the modern city of Alexandria is built. The engineers of 1870 discarded Alexander's Great Harbour, which had been for many years too difficult and shallow for shipping, and the entrance to which

ANTIQUITY

was still dangerous and difficult to make. They returned to the western side of Pharos, and their great breakwater, like the south mole of the ancient harbour, was based on Ras el Tin. The modern harbour occupies what was the roadstead of its predecessor of 4000 years ago.

TYRE

Tyre was another famous pre-hellenic harbour (FIG. 6), but it is only a few years ago that a true plan of its works was published by Père A. Poidebard. As a result of three years' research, from 1934- to 1936, in which he made brilliant use of aerial observation and photography, coupled with submarine observation and photography, Poidebard was able to demonstrate the incorrectness of all previous plans, and the unreliability of any plan made of ancient works unchecked by careful research and observation on the spot.

History has given the Phœnicians a reputation as builders and engineers. A delightful story is told by Herodotus in his description of the cutting of the Canal of Athos, which illustrates their skill as engineers. 'When the trench grew deep', he writes, 'the workmen at the bottom continued to dig, while others handed the earth, as it was dug out, to labourers placed higher up upon ladders, and these taking it, passed it on further, till it came at last to those at the top, who carried it off and emptied it away. All other nations, therefore, except the Phœnicians, had double labour; for the sides of the trench fell in continually, as could not but happen, since they made the width no greater at the top than it was required to be at the bottom. But the Phœnicians showed in this the skill which they are wont to exhibit in all their undertakings. For in the portion of the work which was allotted to them they began by making the trench at the top twice as wide as the prescribed measure, and then as they dug downwards approached the sides nearer and nearer together, so that when they reached the bottom their part of the work was of the same width as the rest'. As builders they are, as everyone knows, renowned for the work they did for Solomon in building the temple of Jerusalem, whose 'great stones', 'wrought stones', and massive brass pillars 18 cubits high, modelled on those in the temple of Melkart, at Tyre, so impressed the Jews.

Tyre had two harbours (FIG. 6), the Sidonian on the north of the island and the Egyptian on the south, and like Pharos, a spacious roadstead to protect ships from the stress of the open sea when making the entrances. The Sidonian was what the ancients called a closed (*kleistos*) harbour; that is to say, it was within the circumvallation of the city

ANCIENT HARBOURS

and its entrance could be blocked by suspending a chain from one side to the other. The Egyptian was an open (*aneimenos*) harbour, outside the fortifications but adjoining them.

Tyre was a very old city, dating back, according to Herodotus, to 2750 B.C. This is probably incorrect, but at all events by 1400 B.C. its renown was widespread, and by 1100 B.C. its seamen had passed

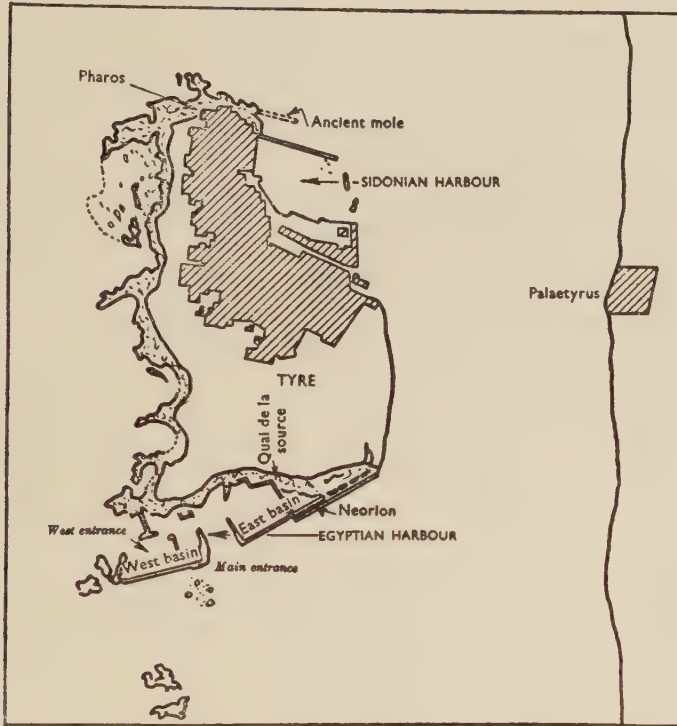


FIG. 6. TYRE, SHOWING CORRECT POSITION OF EGYPTIAN HARBOUR

Gibraltar and had dared the Atlantic. It was probably about this time that the Sidonian harbour was built. Hiram, king of Tyre (970-936 B.C.) friend and ally of Solomon, was a great builder and engineer. When he came to the throne Tyre was separated into three islands by arms of the sea full of reefs. Hiram filled these channels and on part of the land so reclaimed built the Egyptian harbour, not as Maspero and others have asserted, on the southeast of the island, but, as Père Poidebard's discoveries have shown, along its south coast

ANTIQUITY

(FIG. 6). A massive mole, 2500 feet long, runs from the southeast corner to a large exposed rock lying off the southwest corner. Two similar moles, one running northwards from the rock at the end of the south mole, and the other running southwards from the shore of the island, enclosed the harbour on the west. The ends of these walls overlapped so as to form a protected entrance from the open sea to the western basin.

Two marked advances had occurred in constructional methods since the days when the harbour of Pharos was built, namely, the use of concrete in making sea-walls, and the use of iron dowels run in with lead. Both of these methods were used at Tyre.

The moles were very solid structures (PLATE I). They had foundations of large, hewn, rectangular blocks, all laid as headers. The middle was composed of hard concrete divided at intervals into compartments by transverse bonding. The side bordering the sea was faced with squared slabs, 10 feet long by $4\frac{1}{2}$ feet thick, laid as stretchers. The south mole varied in width from 24 feet to 26 feet, whilst the two western moles, which had to face the full force of the sea, were $7\frac{1}{2}$ feet wider.

In the middle of the south mole was the main entrance to the harbour, and from each side of it two large wharfs, built of concrete and faced with stone, were built across the interior for about two-thirds of its width. The narrow passage thus formed was commanded by a fortified post on the island. This passage was the boundary between the western and eastern basins.

A concrete wharf, the *Quai de la Source* on Père Poidebard's plan, cut the eastern basin into two, the farther and smaller one of which appears to have been paved throughout with flagstones and to have been used as a *neorion*, or shipbuilding and repairing yard, equipped with slips and storehouses. Père Poidebard thinks that it may have communicated with its neighbouring basin by means of an inclined plane, but M. Bertou thought it had direct access to the sea. Possibly both methods existed. At the northern corner of the outer eastern basin, where the *Quai de la Source* abuts the island, was a small basin which accommodated a drinking-water tank for replenishing ships—an important item, for water was precious in Tyre, nearly the whole supply of the island having to be brought across by boat from springs on the mainland.

The Sidonian harbour made use of a small bay at the northeast side of the island and was partly surrounded by the city. Two jetties,

ANCIENT HARBOURS

one jutting out from the ancient tower near the modern lighthouse and the other coming from the opposite side in a northerly direction to meet it, protected its entrance. Père Poidebard was able to trace the northern jetty, and thus to prove that it lay some distance beyond the existing jetty of Sur and that the ancient harbour was larger than the modern. The construction of the jetties was similar to that of the moles in the Egyptian harbour.

Old authorities record that the two harbours were connected by a canal, but it is not shown on Père Poidebard's plan, or on Berthou's, made in 1846. It is, however, possible that there was communication through the arm of the sea said to have been reclaimed by Hiram. It was a common custom in ancient harbours to have two separate but interconnected basins, and Sidon, which also belonged to the Phœnicians, was laid out on this plan, which had obvious advantages. Vessels could enter one of the basins when a contrary wind prevented them from entering the other; if one basin was made unsafe by a storm, ships could move through the canal and take refuge in its neighbour; whilst if an enemy attacked he would have to split up his fleet or risk being surprised by the defenders who, having escaped through the other entrance, might attack him in the rear.

In addition to its harbours, Tyre took care to protect its roadsteads. North and south of the island ridges of rock, partly submerged and partly exposed, stretched parallel to the coast and formed a natural barrier against the waves. That they were not, however, considered sufficiently effective has been made clear by Père Poidebard's discovery of traces of two separate lengths of wall based on the southern line of reefs, one about 1000 feet and the other 1650 feet in length. These walls were of massive structure, 100 feet wide, and were faced with rocks, some of which were 10 feet square by $2\frac{1}{2}$ feet thick and weighed about 15 tons (PLATE II). Probably, although sufficient evidence is not yet available, there was a similar reinforcement of the north reef. Traces seem still to have been in existence when Maundrell visited Tyre in 1697, for he reports that the harbours were 'in part defended from the ocean, each by a long ridge resembling a mole stretching directly out on both sides, from the head of the island; but these ridges, whether they were walls or rocks, whether the work of art or of nature, I was too distant to discern'. That they were in part works of art is proved by the fact that the stone used is different from the rocks upon which it is laid, and that it must have come from quarries on the mainland where a similar stone is found. One cannot help wishing that more information

ANTIQUITY

was available as to how these immense masses of stone were conveyed to the spot and laid with such accuracy. M. Henri Watier, whom Poidebard consulted, considered the construction of such works perfectly practicable in antiquity. 'Several divers could', he says, 'easily push stones of nine tons weight into place as they were being let down by ropes'. The divers of Tyre, who were accustomed to collect the shellfish *murex* for the famous purple dye, would be ideal for such work. It is known that they could remain below water for one minute and a half.

Tyre enjoyed many centuries of fame as the finest and richest city in the world. All will recall the three vivid chapters in which the prophet Ezekiel describes the city and foretells its fall—'thy riches, and thy wares, thy merchandise, thy mariners and thy pilots, thy calkers, and the exchangers of thy merchandise, and all thy men of war, with all thy company which is in the midst of thee, shall fall into the heart of the seas in the day of thy ruin'. Even in the bitterness of his scorn he cannot refrain from a note of admiration; 'by thy wisdom and by thine understanding thou hast gotten these things'.

Five hundred and eighty years after the death of Hiram came Alexander the Great. Tyre, unconquered still, was too great a danger to leave behind him while he was away subduing the East. Alexander's fleet was too weak to fight her at sea. Nothing daunted, he attacked from the land, and for this purpose he built a colossal mole 100 feet wide and $\frac{1}{2}$ mile long in three fathoms of water, so that Tyre ceased to be an island and became a peninsula. He demolished the old city of Palætyrus for stone and robbed the forests of Lebanon for timber to accomplish his purpose. In nine months he completed his task and captured the city. The laws of nature asserted themselves; coastal drift completed what Alexander began, and now Sur, the ancient Tyre, is connected to Syria by a broad neck of land.

The following interesting example will illustrate the efficiency of the ancient harbour engineer. Some years ago a friend of mine went out to advise on the construction of a harbour in the Black Sea. After careful study, he recommended a plan for a rubble stone breakwater protecting a deep-water pier. On his return journey his ship called at Samsoun, the ancient colony of Amisus. As he had never been at Samsoun before, he went ashore, and was interested to find the ruins of a rubble breakwater sheltering a massive quay-wall, made of great blocks of masonry, which might almost have been built to the plans he had just drawn up. The ruins dated back to the days of Darius, say about

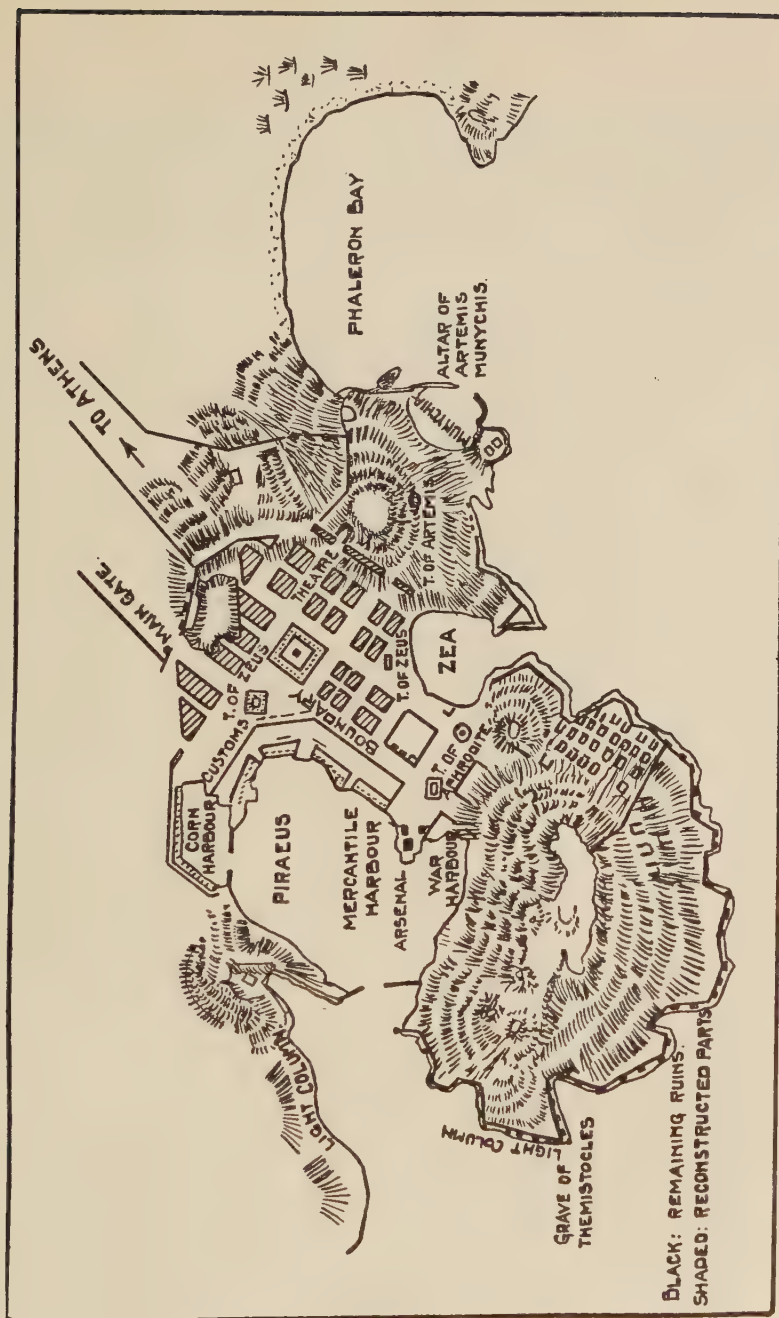


FIG. 7. PLAN OF PIRAEUS, ZEA, AND MUNYCHIA

ANTIQUITY

500 B.C. and I am very tempted to see in them the 'wisdom and understanding' of a Tyrian engineer, for it is known that the Phœnician interests extended thus far. Perhaps there is a powerful *genius loci* in the Black Sea; be that as it may, it is interesting that a Phœnician engineer (if my surmise is right) and a British engineer, separated in time by $2\frac{1}{2}$ millennia, should have solved a problem in almost exactly the same way.

GRECIAN HARBOURS

When we come to Grecian times a rather different state of things is found. The shores of Greece and those of most of her colonies abounded in deep bays and long arms of the sea stretching inland, forming excellent natural harbours that required little in the way of artificial works to make them safe refuges. Moreover, Greece was divided into many small states, each of which, except Doris, Arcadia, and a few others with no seaboard, had its own port. Great harbours of cyclopic stonework like Pharos and Tyre were, therefore, unnecessary. Generally all that their natural harbours needed, apart from quays and wharfs, were short moles to narrow the entrance.

In the early days Athens used the broad open bay of Phalerum, where ships were beached in sight of the city. That arrangement had several disadvantages. In a surprise attack the enemy might land and paralyse the defenders before they could get down from the city and launch their ships; a more serious and permanent objection was that vessels had to lie out in the open exposed to the elements, an important fact when it is remembered that no voyages were undertaken between November and March. When the Persian danger arose, Themistocles, in 493 B.C., persuaded the Athenians to transfer their shipping to the fine natural harbour of Piræus and its two small neighbouring land-locked bays of Zea and Munychia (FIG. 7). The works initiated by Themistocles and completed by Pericles gave Athens one of the safest and most convenient harbours in the ancient world. All three harbours were enclosed in one circuit of fortifications and connected to the city by the two famous long walls. The natural entrances to Piræus and Munychia were reduced in width to 55 yards and 40 yards respectively by the construction of solid breakwaters. Zea needed no narrowing. Apparently those breakwaters were constructed by heavy rubble thrown into the water and allowed to assume a natural slope. When the mound thus formed reached water-level a superstructure of huge blocks, some of them 10 feet square, fastened together with iron cramps, run

ANCIENT HARBOURS

in with molten lead, was built. This was the usual type of Grecian pier. Piræus, the main harbour, was divided into three chief basins, the mercantile harbour, in the centre, which occupied most of the area, the small corn harbour on the north, and the war harbour in the south. In the centre was the *agora*, or market, of Hoppodamus ; on the western margin of the War Harbour (the *Kantharos*) extended the emporium or *deigma*, flanked by a series of porticos, the centre of commercial activities ; near the entrance to the corn harbour was another large *agora*. Around the three harbours shipsteads were built, in which

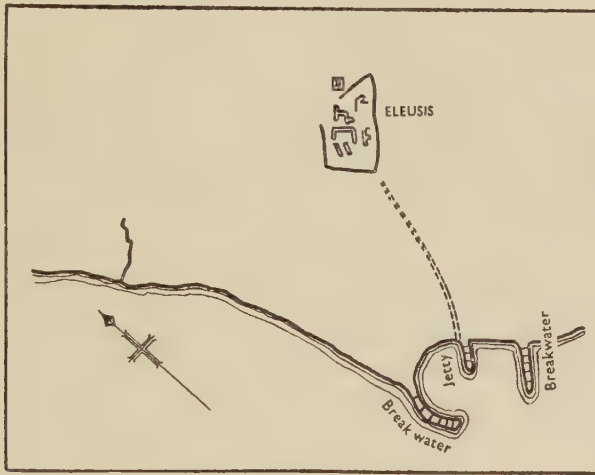


FIG. 8. ELEUSIS HARBOUR

vessels could lie high and dry. They formed an essential part of the dockyard, especially for warships, which put to sea only on active service. If the triremes were left lying in the water they soon became leaky and unseaworthy, and also were liable to be attacked by the *teredo*. Their wooden fittings were stored alongside the vessels in the shipsteads ; hanging tackle, sails, and ropes were kept in the large arsenal at the entrance to the War Harbour. Traces of such buildings in Zea and Munychia are still in existence ; those around Zea were roofed by low gables supported on stone columns, each gable sheltering two triremes.

Piræus, Zea, and Munychia were typical examples of the Greek natural harbours. At some places, however, artificial harbours had to be constructed, of which that at Eleusis (FIG. 8) may be regarded as typical, as the others were planned on a similar general principle. Two

ANTIQUITY

breakwaters were built out from the shore, curving inwards to form a narrow entrance between their ends, the space enclosed being an obvious imitation of a natural bay. Within the harbour was a jetty. This jetty and the breakwater were constructed in the same way, with a foundation of dumped stone and a superstructure of large blocks held together by iron dowels. In all cases the material used was stone, probably because the art of pile-driving was not yet sufficiently developed to make the use of piles safe in harbour engineering, although piling had already been used in house-building for many centuries, and probably, also, because piles were liable to attack by *teredo*.

ROMAN HARBOURS

'Italy', wrote Mr H. Stuart Jones, 'is not furnished by nature with many good harbours. The estuaries of her greater rivers—the Po and the Tiber—are subject to rapid accumulation of alluvial deposit, and some of her natural roadsteads, such as Antium, are rendered unfit for remunerative harbour-works by reason of their shifting sands. Few are the harbours such as Brundisium, where a safe anchorage is provided by natural spits and promontories. The Romans were therefore obliged to face technical problems of no small difficulty when their growing commerce demanded effectual shelter in the ports of Italy'. The Romans were essentially practical people, and in dealing with those technical problems they introduced many new methods, among which the most outstanding were the use of the arch, the cofferdam, hydraulic cement (*pozzuolana*) and the driving of piles in deep water. The discovery of *pozzuolana* in the third century B.C. brought about a radical change in building and civil engineering structures. 'Mixed with lime and rubble' wrote Vitruvius, 'it not only furnishes strength to other buildings, but also when piers are built in the sea, they set under water and can be dissolved neither by the waves nor by the power of the water'. The Egyptians, as I have shown, used the cyclopic dry-stone structure; the Greeks used large ashlar masonry held together by iron dowels and lead; the Romans used their famous, almost everlasting concrete made of *pozzuolana*, lime, and stone; and it was *pozzuolana* that rendered possible the erection of those gigantic vaulted structures found all over the Empire. Piles were used in bridgework and foundations; but the great importance of pile-driving, so far as we are concerned at the moment, was that it enabled the engineer to make cofferdams for pier-building.

Vitruvius, in his treatise on architecture and civil engineering,

ANCIENT HARBOURS

De Architectura, written at the beginning of the first century A.D., has at the end of the fifth book a short chapter on harbour engineering. His object was to deal with the methods by which ships could be protected against storms and tempests. After a reference to the usefulness of natural harbours, he explains the technique of building breakwaters by means of cofferdams (*arcae*). In the last section of the chapter he states that shipyards should have a northern aspect whenever possible, because southern aspects, owing to their warmth, generate dry rot, *tinea*, *teredo*, and other kinds of noxious creatures. In any case, he says, wood should be used as little as possible on account of its inflammable nature. His remarks on the construction of breakwaters are of considerable interest. Four different methods are described. In the first case, where a masonry dam had to be made in the sea, he advised a cofferdam made of oak piles bound firmly together with chains. When this was finished the bottom was to be levelled and cleared, and a platform of beams laid upon it. The whole space above this was to be filled with stones embedded in a mortar composed of 2 parts of hydraulic cement to 1 part of lime. Next he discusses what should be done in places where hydraulic cement is unobtainable. In this case a double cofferdam should be built and the spaces between the walls of each cofferdam filled with clay in wicker baskets, tightly rammed down to make them watertight. The interior was then to be pumped dry by means of water-screws and water-wheels, and, if the bottom were hard ground, a concrete wall composed of stone, lime, and sand was to be built upon it, the lower portion being made wider than the upper. If, however (and this is his third method) the ground at the bottom was soft, the foundation had to be prepared by putting down a layer of piles of charred alder and olive-wood filled in with charcoal. On this the outsides of the walls were built of squared stone, with the longest possible joints, so that the middle stones might be well tied together by the bedding. The middle was filled with rubble or masonry work. In a very difficult passage, he describes a fourth method, to be employed when it was not possible to use cofferdams owing to the violence of the sea. A mound was built out as far as possible, at the end of which small walls, springing from just below the water, were built up to the level of the top, forming an empty space between themselves and the slopes of the mound. This space was filled with sand, and formed what he called a margin. On this margin a large pillar of masonry was built and was left two months to dry; after that period the walls were cut away, and when the sand was scoured by the action of the waves the

ANTIQUITY

pillar fell into the sea as a solid monolith. 'In this way' says Vitruvius, 'as often as is necessary, the pier is carried further into the water'. It must, however, have been a very slow process.

The Roman ideal plan of a harbour is clearly expressed by Virgil in the first book of the *Æneid* :

*'Est in secessu longo locus : insula portum
Efficit objectu laterum ; quibus omnis ab alto
Frangitur. . . .'**

This, translated into an artificial harbour, presents us with the two incurving breakwaters of the Greeks, but with the Roman addition of a short protecting mole or island breakwater in front of the entrance, a type found in the important harbours of Antium, the Claudian harbour at Ostia, Centum Cellæ, etc. (FIG. 9).

There were, however, exceptions to this rule. At Puteoli, on the bay of Naples, one mole originally protected the harbour. It was of a peculiar type introduced by the Romans, consisting of an arcade of fourteen arches resting on fifteen piers, each about 50 feet square. The foundations of the piers were built of pozzuolana concrete, as laid down by Vitruvius, the upper portions being filled with fragments of tufa and brick. In addition to the mole there are also remains of a number of basins protected from the sea by a double row of piers ; those in the outer row were rectangular and probably carried arches, whilst the inner piers, opposite the open archways, are trapezoidal in section. Caligula built a floating bridge from the end of the main pier across the bay to Cumæ, a distance of 2-3 miles, which probably had also the military object of protecting the upper end of the bay of Naples against attack by sea.

The sand problem caused the Romans considerable trouble. Although some form of dredging is said to have been practised by the ancients in maintaining and deepening their irrigation channels, no record exists that it was ever developed sufficiently to enable them to use it to deal with silting in river-channels and harbours. The arcade form of breakwater was an attempt to use the tidal current to scour harbours, but usually failed in its purpose. The problem remained and silting drove the Romans from the harbour at Antium, and from the Tiber, and turned the magnificent harbour at Ostia into a failure. Speaking of the problem at the mouth of the Tiber, Sir John Rennie wrote, 'Upon referring to the history of the shore, at the mouth of the

* 'There is a deep bay in a roadstead ; an island forms it into a harbour by the shelter of its sides, which break every wave from the open sea'.

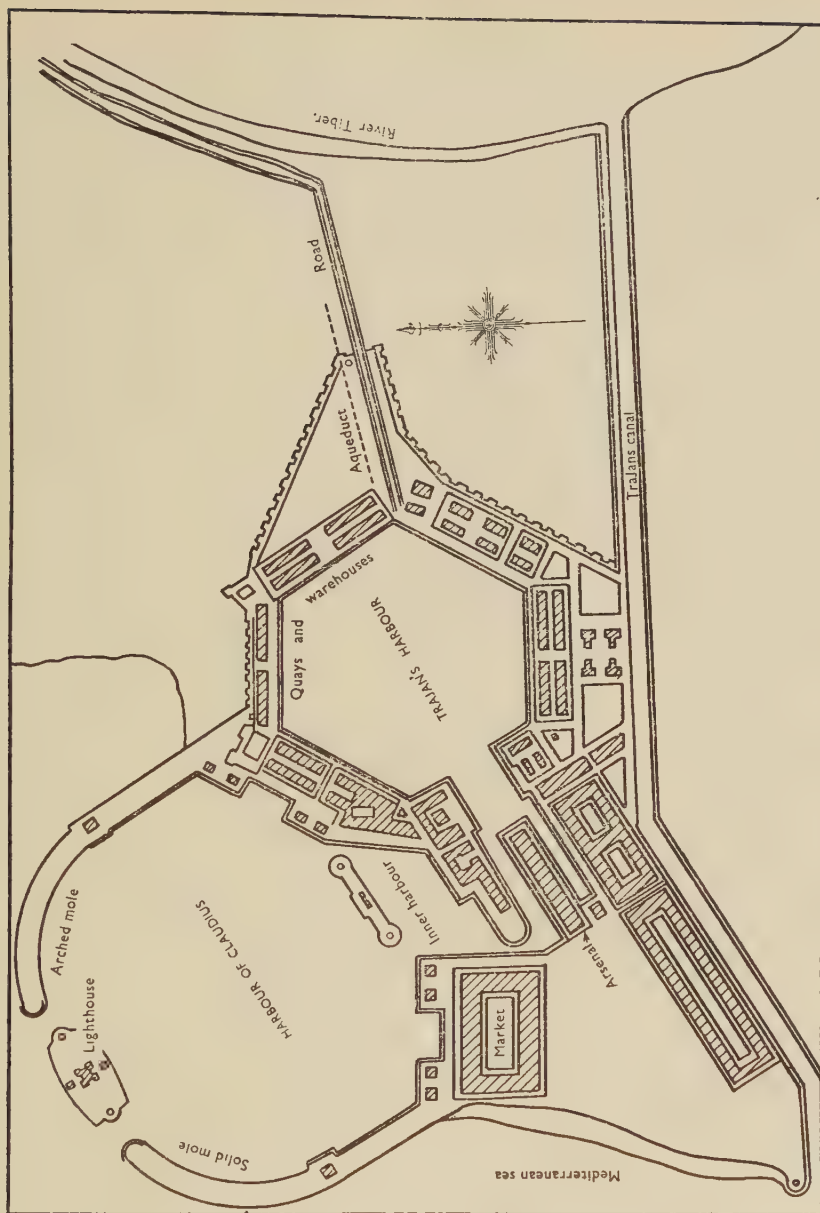


FIG. 9. THE CLAUDIAN AND TRAJAN HARBOURS OF OSTIA

ANTIQUITY

Tiber we find that from the foundation of Ostia by Ancus Martius in 634 B.C. to the end of the Commonwealth in 82 B.C. the line of shore had advanced about 1,100 yards in 552 years ; again from the Commonwealth to the end of the Empire in A.D. 364, a period of 446 years, it had advanced also about 1,100 yards, and from the Empire to the present time, being a period of about 1,400 years, it has advanced 2,550 yards, making a total distance of about 3 miles 600 yards in 2,480 years ; and a projecting delta is formed at the mouth of the Tiber '.

Many efforts were made to keep the Tiber open below Rome by revetting the banks and controlling the channel to induce scour, but all in vain. Gradually all shipping, except boats of the shallowest draught, was forced down to the lower part of the estuary, whence goods had to be transferred by barge to Rome. A great deal of the trade was transferred to Puteoli, which came to be regarded as the port of Rome and rose to the position of the premier commercial harbour of Italy ; but its distance of about 140 miles from the metropolis, along the Via Appia, formed a serious inconvenience in view of the slowness of transport in those days. Moreover a safe harbour nearby was needed to accommodate the fleet which had the duty of guarding the mouth of the Tiber. Cæsar realized the urgency of the problem and proposed to build a new port, but he was prevented from doing so by the objections of his engineers. In A.D. 43 Claudius overruled these objections and gave orders to proceed with the work (FIG. 9). A spot was chosen on the sea a short distance north of the river-mouth, and the place was called Ostia, after the town which had been the centre of the port works of the river harbour. This harbour had two basins. The outer was formed by two artificial moles, each 1900 feet long and 180 feet wide. Both moles ran out almost at right angles from the shore for nearly half their length, and then curved inwards, leaving a space of 1100 feet between their extremities. Immediately in the centre, and between the extremities, was an isolated mole, 780 feet long by 400 feet wide, leaving an entrance of 160 feet on either side. To form this mole the ship which had conveyed a huge obelisk from Alexandria to Rome for Caligula's Circus was filled with concrete and sunk. Great concrete masses were then piled on the top of it until the mole reached the surface. A lighthouse after the model of the famous Pharos of Alexandria was built on this island mole. The circular part of the main northern breakwater was constructed upon arches, in the hope that the current would prevent accumulations of sand. The southern breakwater was solid throughout, to prevent the entrance of drifting silt and

ANCIENT HARBOURS

sand from the mouth of the Tiber. The depth of water in the basin is unknown, but Sir John Rennie estimated that it would range from 15 feet to 20 feet at low water. The area was about 130 acres. At the upper end of this main basin was a smaller one of 1200 feet long and 520 feet wide, covering an area of about 7 acres. It was separated from the main basin by an island mole similar to that in the main

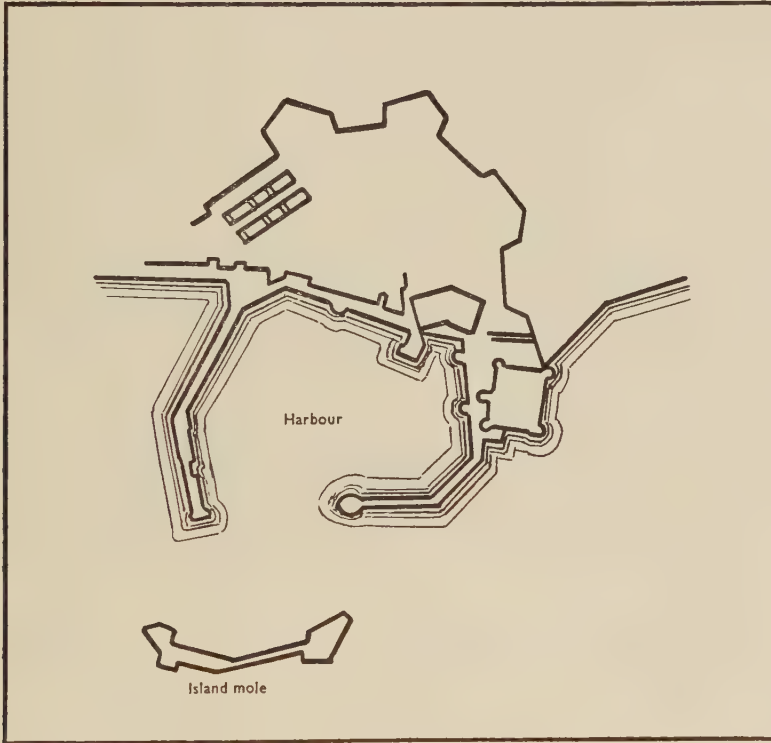


FIG. 10. CENTUM CELLAE HARBOUR

entrance. A very large portion of the harbour was dug from the mainland, and it is said that this involved the excavation of 80 million cubic feet of earth. In spite of the vast amount of money and care expended on this work the harbour was not a success. Tacitus reports that 200 ships were sunk in the harbour itself during a storm in A.D. 62. Trajan (A.D. 92-117) added an inner basin, hexagonal in shape, with an area of about 70 acres. Claudius had dug two canals, running parallel to each other, connecting the harbour with the sea and the Tiber. To

ANTIQUITY

remedy this, Trajan took up part of one of these canals in creating his new basin and filled up the other. He then dug a fresh canal, which has since become the mouth of the Tiber, the river having deserted its old course. The harbour was well provided with quays, transit-sheds, and store-houses, some of which were finished, regardless of expense, with marble tiling.

The Roman engineers were right when they advised against building this harbour. The forces of nature were against it from the beginning, and today the remains of the great port of Ostia lie buried in sand a mile from the shore. The tendency must have begun to become obvious even in the reign of Trajan, for he took measures to provide a new harbour for Rome a little higher up the coast. The result was the harbour which, under its modern name of Civita Vecchia, is now the principal port of Rome. Centum Cellae (FIG. 10), to give it the name by which it was then called, was planned and built on precisely the same principles as those employed at Ostia, except that in it the island mole overlapped the ends of the main breakwater, instead of lying between them. The harbour, as its name implies, was provided with one hundred covered *cellae*, or docks for warships.

The Roman Empire was followed by a period of more than a thousand years of quiescence, or even retrograde action, in harbour engineering. I know of no great harbours, such as those which I have described, that were built during the dark periods of the Middle Ages. We have to wait till the great engineering revival that began about the middle of the 18th century before we find such ambitious schemes again attempted.

It is, however, interesting to study the debt we owe to the ancients. The similarity of their treatment of problems to the methods of the modern engineer is, as I have tried to show, in many cases, very remarkable.

Sea-trade in Early Times

by JAMES HORNELL

THE few indications that have come down to us of ancient sea-traffic between the countries lying around the shores of the Red Sea, the Persian Gulf and the Indian Ocean are so fragmentary and obscure that it is extremely difficult to reconstruct any definite picture of their character and extent. In spite of this handicap study of the meagre evidence available compels the belief that movement by sea, although of a fluctuating character and confined for the most part to coastwise voyaging, was far more active and advanced in parts of this area in very early times than is generally realized. Had it been otherwise how could we interpret the signs graven on the rocks of the ravines of the Egyptian desert, and the transport by sea of great blocks of stone to Sumer in the time of Gudea of Lagash ?

The earliest evidence at present available comes from the Red Sea and the Persian Gulf, though it does not follow that either area is the cradle of sea-faring. It consists of :—

(A) innumerable prehistoric and predynastic petroglyphs of ships engraved upon the rocks of the eastern desert of Egypt, particularly those in the Wadi Hammamat region ;

(B) the discovery on Sumerian sites of diorite statues, stated specifically to have been brought by sea from foreign lands early in the third millennium B.C. ;

(C) the presence in the ruins of Ur, Kish, and Lagash of artifacts cut from the shell of the sacred Indian chank (*Xancus pyrum*) ;

(D) historical records of trading expeditions sent by sea from Egypt to Somaliland extending from the vth to the xiiith Dynasties, and repeated in the xviiiith Dynasty.

The periods when long-distance voyaging was markedly active were intermittent ; they coincided with the reigns of princes of outstanding energy and martial success desirous of setting up imperishable memorials in stone of their great deeds, or of acquiring valuable metals, precious stones, incense for the Gods, and articles of foreign luxury. Alternating were times when the stress of unsettled political conditions

ANTIQUITY

restricted sea-faring to petty trading from port to port. These fluctuations in commercial relations continued in the Indian Ocean region until the time of the Ptolemies, when large-scale commerce by sea assumed a regular and semi-permanent character thanks to the enterprise of Greek rulers and Greek traders, and to the growth of demand from Europe for the varied commodities of India and the Far East.

THE EGYPTIAN PETROGLYPHS

The great profusion of prehistoric and predynastic petroglyphs found upon sandstone rocks in the eastern desert of Egypt, particularly (as at present known) among the hills and wadis on the route between the Nile at Quft and the coast at Kosseir,¹ furnishes conclusive evidence of the presence of a fairly numerous population during a long-distant and lengthy period. The remoteness of its age is shown by the patination of the figures, the crudity of the execution, and the simple character of the weapons and boat-designs depicted. No permanent inhabitants are to be found there today and no people have been settled in the area within recorded history; the only folk of a later age ever quartered there in considerable number were slave quarrymen and their guards in dynastic times, who certainly did not grave these figures and who required a highly organized commissariat to keep them supplied with food and water, otherwise awaiting in these now desolate ravines. When I visited some of these rock-sculpture sites on the way to the Wadi Hammamat in 1938, the only people met were a weary camel man and his son passing Nilewards.

At the time when the scenes depicted were graved, the climatic conditions were entirely different from those now prevailing. Instead of a land sun-baked and arid as at present, the eastern desert was blessed with a copious rainfall; vegetation in consequence was abundant, with bush and grassland sheltering antelopes and wild cattle, giraffes, wild asses, barbary sheep and ostriches, together with a host of animals which have now to be sought far to the south in the forests and plains around the headwaters of the Nile—even elephants were numerous.

Boats are among the commonest subjects depicted; they are extremely numerous. They fall into two main constructional categories with several intermediate modifications, proof that over a prolonged period peoples of differing cultures occupied wide areas of what is now the eastern desert of Upper Egypt. The earlier of the craft

¹ H. A. Winkler, *Rock-drawings of Southern Upper Egypt*, pt. 1. (Egypt Exploration Society, London, 1938).

SEA-TRADE IN EARLY TIMES

represented are closely related to those painted upon pottery of the predynastic Gerzean age—broad-beamed craft propelled by many paddlers, with the hull curved in crescent fashion. Unprovided with sails these are obviously fair-weather vessels, such as could only be used for travel on quiet inland waters. In such craft immigrants from the land of Punt, the legendary home of the Egyptians, may well have arrived, passing northward into Egypt along the Nile valley.

Other figures of boats of a different type, straight along the keel and with tall, sharply upturned ends (FIG. 1), exhibit a decided advance in the art of boat-building, although they appear to have been contemporary in time with the craft of crescentic hull-form. These belonged without doubt to a race of incomers who met and gradually mingled their blood with the people of the country, the owners of the curved type of river canoe, obviously constructed of papyrus bundles. The new type in its general form and the occasional presence of a figure-head on the summit of the upturned prow, is distinctly suggestive of close relationship with the vessels used upon the Euphrates and the Tigris from early days, and particularly with the river craft seen upon Assyrian sculptures from the ruins of the palace of Sargon II at Khorsabad (FIG. 3).² Winkler hazards the hypothesis that these boats brought a virile, energetic people by sea from Mesopotamia, and I would be inclined to agree with him were the voyage less lengthy and beset by fewer dangers. Suggestions have indeed been made by several writers that journeys along the same route were performed by Persian Gulf mariners in the time of Gudea of Lagash and other Babylonian rulers in the first half of the third millennium B.C. These I am unable to accept as possible at such an early period, knowing from experience something of the hardships and difficulties experienced by small craft during a voyage along these rugged and exposed shores.

A more feasible explanation is based upon the fact that during the prehistoric period under consideration, the fertile regions of Arabia, in common with those of Egypt, were considerably more extensive than at present. While the northern region and most of the interior of Arabia were in the occupation of Semites, the coast-people of the Persian Gulf, who seem to have been akin to the early inhabitants of Lower Mesopotamia and Elam, would tend to spread coastwise through Magan along the Ocean seaboard and thence find their way into the Yemen. For the high-prowed, canoe-shaped craft of the rock-gravings the crossing of the Red Sea at its southern end would present little danger or

² A. H. Layard, *Nineveh and its Remains*, II, 383.

ANTIQUITY

difficulty ; once across and settled, these immigrants into Africa appear to have resumed their coastwise expansion. How far this spread we shall not know until further search for rock-gravings in the Sudan affords the necessary data. At present our knowledge is confined mainly to the hinterland of Kosseir. This locality at the time in question must have been a veritable Land of Promise for the immigrants ; during the rainy season the Wadi Hammamat and the other wadis of the surrounding country were the beds of streams of considerable volume, irrigating and fertilizing the low lands around which are now a desert of sand and gravel.

The foreign boat carved on the Gebel el-Araq knife-handle (FIG. 2) is of the same general type as that used by these intruders from the Arabian coast (FIG. 1). It has a similar hull-form, but the mast and other equipment suggest an advance in design consonant with an origin considerably later in time. The context also implies a condition of strife between the incomers and those whom we cannot doubt were the principal stock from which the mass of the people of Egypt have been derived.

DIORITE STATUES OF EARLY BABYLONIA

Positive evidence of the existence of organized ship-trade in the Persian Gulf in the first half of the third millennium B.C. is afforded by the frequent use of a fine-grained diorite of oversea origin for statues and other monuments, erected by Sumerian and Semitic rulers of the city-states and petty kingdoms that flourished at that period in Lower Mesopotamia.

The coast people living at the head of the Gulf were noted as busy sea-traders then and for long after ; ' the cry of the Chaldaeans is in their ships ' says Isaiah (XLIII, 14). How true this was is apparent when we read in the inscriptions upon the monuments of Gudea of Lagash and of Naram-Sin of Agade that the stone whereof they were made was brought by sea from the mountains of Magan.

The earliest of these stone witnesses are those of Manishtusu (*c.* 2800), son of the great unifier, Sargon of Agade. All of these bear a standard inscription setting forth that the king had brought back the stone from an expedition ' in ships from the mountains beyond the Lower Sea ', the term used in Babylonia for the Persian Gulf—the Upper Sea being the Mediterranean. In the reign of his immediate successor, Naram-Sin (*c.* 2795–2739), another naval expedition was launched against rebellious vassals in the coast lands of the Gulf.

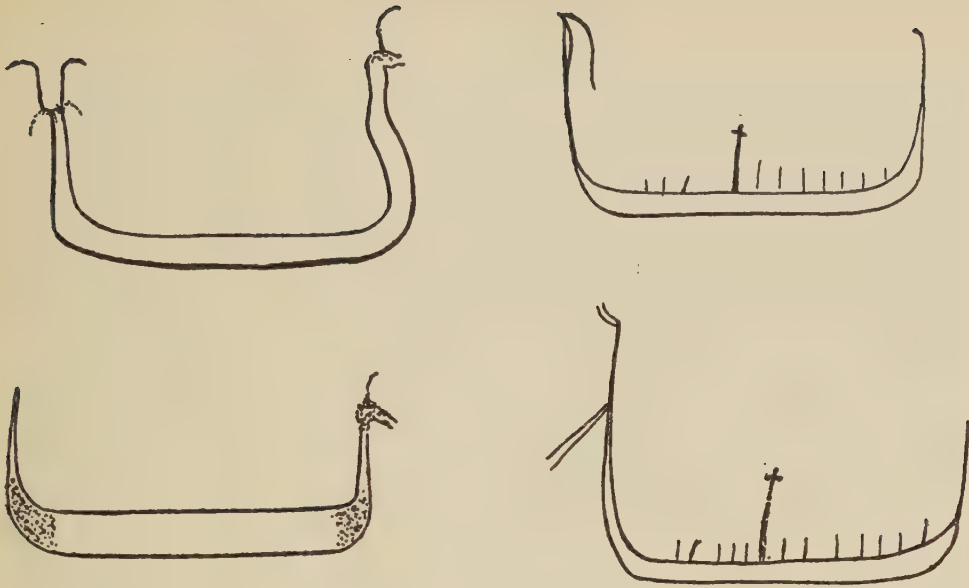


FIG. 1. FOUR PETROGLYPHS OF 'FOREIGN' BOATS, EASTERN DESERT, EGYPT (see p. 235)
after Winkler, but with the hammered outlines smoothed



FIG. 2. THE FOREIGN SHIP CARVED
 ON THE GEBEL EL-ARAQ KNIFE
 HANDLE (see p. 236)
after Bénédite

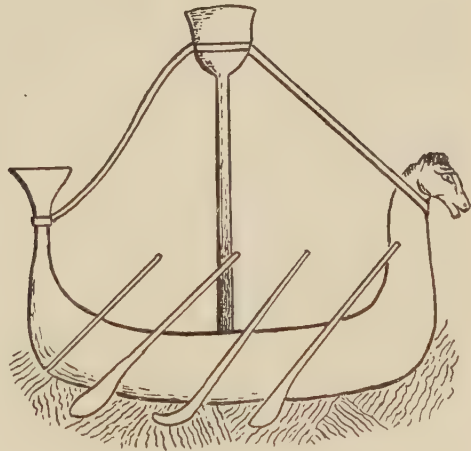


FIG. 3. ASSYRIAN VESSEL, FROM KHORSABAD
 (see p. 235)
after Layard

ANTIQUITY

Of a block of diorite brought back he caused to be made a statue of himself; in a fragmentary inscription we read that he had smitten Magan and captured its king. A marble vase looted from Magan is inscribed 'Naram-Sin, king of four regions, a vase, booty from Magan'.

Gudea, the *patesi* of Lagash (c. 2600) was still more avid of self-glorification. No less than twelve of his statues, all of diorite, have been recovered. Of these the inscription on the one known as statue C states that Gudea brought from Magan the stone from which it was sculptured; on another, statue D, mention is made of the building of a ship for the goddess Bau and of voyages made to Magan and Melukhkha.

Identification of Magan, and of Melukhkha which is usually coupled with it, has long been an archaeological stumbling block. Many authorities believe Magan to be Sinai Peninsula; even H. R. Hall³ considers that material for the early Sumerian statues was freighted by sea from Sinai or from the Wadi Hammamat area of Upper Egypt. S. H. Langdon,⁴ however, writing in the same volume dissents and considers that Magan was somewhere in the coastal lands which stretch from the modern El-Hasa, opposite Bahrein, eastwards to and inclusive of Oman. Only the geologist can decide this question authoritatively; microscopic comparison of the crystalline structure of the diorite of the statues with that of diorite from all available sources in Oman, Upper Egypt and Sinai is necessary if the problem is to be lifted out of the haze of hypothetical uncertainty. In my opinion the localization of Magan in Oman or on the way thither appears much the more probable for various reasons; of these one which is peculiarly cogent, if indeed it be not decisive, is the mention in the syllabaries of the special quality of the dates of Dilmun, Magan and Melukhkha. The island of Dilmun at the head of the Persian Gulf, traditional cradle of the Sumerian people, was noted for its date palms as is, indeed, the same region at the present day. In Oman too where several of the long lateral valleys have been highly cultivated from time immemorial, groves of date palms still yield fruit of superior quality. By this criterion alone both Sinai and the Eastern lands of Upper Egypt are excluded from identification with Magan. Both localities at this time were rugged and inhospitable lands totally unsuited to date-palm cultivation; what few dates are produced there today are of execrable quality, dry and flavourless, as I am able to bear witness.

³ *Cambridge Ancient History*, vol. I, 583.

⁴ *ibid.*, vol. I, 416.

SEA-TRADE IN EARLY TIMES

Another argument put forward by those who would identify Magan with Sinai is the Sumerian description of Magan as the mountain of copper ; this again has little weight for copper is still found in the Jebel Akhdar, the mountain range dominating the coast of Oman. Taken in conjunction with the occurrence in the same hills of intrusive masses of diorite and the cultivation of date palms in the valleys, we have three weighty reasons for considering Oman and some part of the adjacent southern coast of the Persian Gulf as equivalent to the lands known to the Sumerians as Magan and Melukhkha, rather than the bleak, infertile and far distant regions of Sinai and the eastern desert of Upper Egypt.

A text from Lagash, of the time of Dungi, king of Ur (c. 2456–2398), speaks of the Magans as shipwrights, and as *Ma* is the Sumerian for 'ship', we see in these ancient folk of Magan a people similar to the Omanites of today—expert shipwrights, ocean carriers trading in their own baghlas and bŭms to ports in India, Iraq, Arabia and East Africa, fishing along the coast in innumerable small craft and cultivating in their valleys the date, the vine, the mango, the apricot and the orange.

INDIAN SHELL ARTIFACTS

Shell artifacts from horizons of great age in the ruins of Ur, Kish and Lagash are made from the porcelain-like snow-white shell of the sacred Indian chank (*sankha*), known scientifically as *Xancus* (*Turbinella*) *pyrum* (L.). This large and handsome conch is found only in the coastal waters of India, and Ceylon ; its range is strictly limited, with a discontinuous distribution extending from Kathiawar southwards to Travancore ; thence turning north on the east coast it runs through the Gulf of Mannar to the Coromandel coast, disappearing just south of the Godaverī delta. It is unknown in the Persian Gulf.

The presence of articles made from the chank is positive proof of commercial intercourse with India. The shells might have been carried overland but this would involve a long, difficult and circuitous journey. The probability is far greater that they were carried coastwise, and direct from Kathiawar, in craft similar to those that conveyed a stream of foreign immigration into the western area of Upper Egypt when it was fertile and a hunter's paradise.

The Indian chank has always had religious significance in the eyes of Hindus ; Vishnu holds it in one hand ; Brahman priests pour libations from it to the glory of their gods ; it sounds the call to worship in their temples, and to the Hindu women of Bengal a lacquered

ANTIQUITY

chank bangle has the same significance in marriage as the wedding ring in Europe.

Ancient sites of chank artifact manufacture extend from Cape Comorin to Hyderabad in the Deccan and onwards to Kathiawar, where the shells are still fished in the neighbouring sea. Chanks used as lamps and feeding cups have the central column cut away and of this form are some of the objects found in ancient Sumerian sites. Hitherto these and the plaques bearing carved themes such as we see on many cylinder seals, have been passed over as objects fashioned from shells collected locally in the Persian Gulf. This was impossible, for Kathiawar was the nearest source of the raw material. Commerce with India was necessary and this, almost certainly, followed the sea route. Vessels of similar form have been found at Chanhudaro in the Indus Valley and these are assigned to the Harappa culture, coeval with old levels at Ur and Kish.

After the passing of the city-states of the third millennium there is little evidence of a continuation of commercial intercourse with India by the sea route until somewhere about the dawn of the first millennium B.C. Chank shell artifacts reappear at Susa during the Achaemenid Dynasty *c.* 500 B.C.; fine examples recovered by the French explorers of this site are now in the Louvre Museum.

THE EGYPTIAN RECORDS⁵

The early part of the third millennium B.C. witnessed a stirring of maritime activity in Egypt parallel to what was then happening in the coast lands around the head of the Persian Gulf. As early as the vth Dynasty we find Sahure (*c.* 2958–2946) sending ships to Punt, the modern Somaliland or rather that part of it stretching from Eritrea to Cape Guardafui. As in all subsequent expeditions to this land the chief products sought were frankincense and other aromatic gums essential to the proper service of the gods; ivory and gold too were desired, together with rhinoceros horns, panther skins and rare woods. This, so far as is at present known, is the first occasion when Punt products were obtained by the sea route. Previously the land route across Abyssinia and up the Nile was the usual channel of trade. The probability that voyaging to Punt by way of the Red Sea took place

⁵ The Egyptian chronology followed here is that of H. R. Hall. With regard to the Babylonian dates given above, a lower estimate, varying between 150 and 300 years, is adopted by some authorities.

SEA-TRADE IN EARLY TIMES

in earlier days is by no means precluded, for we know that large ships were in use on the Nile during the 1st and 11th Dynasties and Snefru (*c.* 3100), the last Pharaoh of the 11th Dynasty, caused to be pictured on the walls of his tomb-temple the pageant of a victorious Red Sea fleet.

Under Sahure's successors it seems certain that trade with God's Land, as the Egyptians termed Punt, continued active; we find Pepi II (*c.* 2738–2644) building ships for the royal commerce with that land.

The earlier expeditions to Punt, those by land, were organized by the Lords of Elephantine, 'Keepers of the Southern Door of the Kingdom'; when the sea-route was opened, the preparation of the ships required for the successive trading expeditions was also delegated to them. On one occasion we hear of the massacre of the officer and shipwrights busy with the building of new craft on the shore of the Red Sea; the Lord of Elephantine ordered to recover the officer's body accomplished the task and inflicted punishment on the Bedouin murderers. How active was the Punt traffic at this period may be judged from the boast of an Elephantine official that he had been to Punt eleven times—how often by the sea route is not stated.

Subsequent to the 11th Dynasty no record is known of further sea voyages to Punt until the reign of Sankhkere Mentuhotep of the 12th Dynasty (*c.* 2242–2212). Under his orders Henu, his Chief Treasurer, was ordered to open up the quarries in the Wadi Hammamat and to fit up a ship for a voyage to Punt. His expedition was organized with consummate skill. In spite of the waterless nature of the desert traversed between Koptos and the sea, each of the 3000 quarrymen, soldiers, sailors and followers received daily a ration of two jars of water and twenty small loaves. Leaving the bulk of his men at the quarries, Henu pushed on to the coast and there built and despatched the Punt trader as instructed.

Commercial relations with Punt thus re-opened, were continued at frequent intervals during the succeeding 12th Dynasty. Under Amenemhat II (*c.* 2150–2115) we find two of his commanders setting up inscriptions at the Wadi Gasûs, a small port north of Kosseir, commemorating their successful return from a voyage to Punt. Some years later one of the Senusrets, probably Senusret III, recognizing the disability under which the Punt trade laboured by reason of being based upon a wretched port at the end of a difficult desert route, resolved upon the digging of a canal from the eastern branch of the Nile, through the Wadi Tumilat and the Bitter Lakes to reach the sea at the north end

ANTIQUITY

of the Gulf of Suez. When completed ships thereafter were built wherever facilities were greatest. If laden at Thebes, they sailed down the Nile, through the new canal and out to sea near Suez.

Trade with Punt appears to have been the exclusive monopoly of the Pharaoh, but there is evidence in the 'Story of the Shipwrecked Sailor', a fabulous tale vastly popular with the masses and dating from this Middle Kingdom, that private enterprise from about this period began to take some part in the minor trade of the Red Sea. On the western coast there were certainly trading and victualling stations for the Royal Punt fleet, but the coast is bleak and arid, as is the greater part of the east coast; apart from Punt the little private trade there was would tend to centre round the fertile southwestern corner of Arabia.

With the passing of the xiith Dynasty dark days dawned upon Egypt. Rebellion ruined the land, so sapping its strength through disunion that an invasion of Semites proved successful, with the result that the harsh rule of the Hyksos prevailed for several generations. The two centuries of unrest and foreign rule that lasted before a deliverer appeared caused total cessation of the flourishing sea-trade with Punt. Even when the land was purged of the rough, uncultured Hyksos, no attempt was made to resume commercial relations by the sea route until Hatshepsut, the first great female statesman and ruler known to history, was able to seize supreme power over Egypt. Emulous of the maritime enterprises of the kings of the xixth and xxith Dynasties, she proclaimed a message from Amon, directing that the sea-ways to Punt should be searched out and that incense terraces were to be established in a garden before his temple. Preparations were made upon a grand scale; the twelfth-dynasty canal from the Nile to Suez still existed, or perhaps it was cleared out, and once again a fleet of fine ships, five in number, passed down the Nile, out into the Gulf of Suez and away to Somaliland Punt. Their arrival there caused immense surprise; the Punt chief wondered whence the ships had come—so long ago was the last previous visit from Egypt that surely the way had been forgotten!

Friendly relations were soon established and cargoes of immense value taken aboard, probably of greater value than ever before laden in Egyptian vessels. Gold in great quantity, electrum, ivory, ebony, panther skins, 3300 small cattle, and huge piles of myrrh were among the products which eventually reached Thebes and were there offered to the god, in whose garden the Great Queen planted 31 living myrrh trees.

SEA-TRADE IN EARLY TIMES

Hatshepsut's husband (?) and successor, Thutmose III (*c.* 1479–1447), set a new value upon sea-power ; his fleets dominated the Levant and in the Red Sea his power extended to Punt whence his ships brought back the usual rich and varied cargoes ; these voyages further increased the area dominated by his political power.

After Thutmose III we hear of no important expeditions in the Red Sea until the time of Ramses III (1204–1172 B.C.) This vigorous ruler fostered foreign trade as never before ; he maintained even more powerful fleets both in the Mediterranean and the Red Sea. Large scale sea-commerce as hitherto appears to have been reserved to the Pharaoh, and undertaken to provide incense and wealth for the temples of Amon, Re and Ptah. The twelfth dynasty canal to Suez was, however, silted up and in disuse, and so the Punt fleet had again to be based on a harbour at the Red Sea end of the caravan route from Koptos. These later Punt ships were vessels of considerable size, and handsome appearance, each hoisting a great square sail, maybe chequered in bright colours as depicted on the walls of one of the little store-rooms not far within the entrance to the Pharaoh's tomb in the Valley of the Kings. Larger still was the sacred barge of Amon at Thebes, 224 feet long, built by command of Ramses, and constructed entirely of Lebanon cedar.

After the death of Ramses III, the Empire began rapidly to decline ; it became a prey in turn to Libyans, Ethiopians (Nubians), and Assyrians, of whom none showed interest in developing trade in the Red Sea. Spasmodic bursts of vigour were not wholly wanting to relieve the gloom of national decadence. One such interlude coincided with the reign of Sheshonk I (945–924 B.C.), an energetic Pharaoh, the contemporary of Solomon—probably father of the chief wife of that polygamous Jewish monarch whose political wisdom accepted a position of easy vassalage for the material advantages to be gained. One of these was the privilege to trade to the Southern Sea from the Jewish haven of Ezion Geber at the head of the Gulf of Suez.

Solomon's cherished temple enterprise required large supplies of ornamental timber, precious stones, gold and the fragrant gums needed for the fitting service of Jehovah. Thus was born the first ambitious attempt to open up direct sea-trade with that mysterious emporium known in biblical story as Ophir. To accomplish this project Solomon found it necessary to enter into a working partnership with the greatest sea-king of that time, Hiram of Tyre, who aided him with timber from Lebanon, with shipwrights to build the ships and with pilots and seamen

ANTIQUITY

to take them eastward to Ophir. This port, in my opinion, cannot well have been other than one of the great marts on the west coast of India, where the produce of the gold mines of Hyderabad (Deccan), of the spice lands and timber forests of Malabar, and the gem-workings of Ceylon were concentrated to meet the foreign merchant-king's requirements, just as, in a later age, this role was occupied first by Broach and later by Surat. Frankincense, the only non-Indian product, was probably picked up at a port on the Hadhramaut coast on the return voyage.

To plan a lengthy trading voyage from the head of the Red Sea and across the Indian Ocean without preliminary exploration is unthinkable ; Egyptian sailors during many centuries before had searched out and found the sea-way to Somaliland and where they went Phoenicians would find it easy to follow ; no doubt they took Egyptian pilots with them and they would also find a way of securing a pilot for India at some port on the Arabian coast, just as Vasco da Gama obtained the help of the Arab pilot, Ibn Majid, ' Lion of the Sea ', to guide his ships from Malindi to Calicut. At this time the ports of Saba, the Sheba of the Bible, were the usual marts where Egyptian and Phoenician products were exchanged for those of India and Ceylon, which were carried thence by caravan to their next destination. This being so, it is a safe inference that Solomon's ' wisdom ' in equipping a fleet for direct trade with these countries had the elimination of very greedy middlemen in the persons of Sabaeen traders as its mainspring of action. Here I may mention that the term ' Sabaeen ' as equivalent to Arab lasted at least till A.D. 400, for Fa-hien, who travelled in India and Ceylon (399-414), in describing Anuradhapura in Ceylon (Beale's translation), says : ' in the city there are many Vaisya elders and Sabaeen merchants whose houses are stately and beautiful.' Even today men of mixed Arab and Indian descent, the so-called ' Moormen ', form an important part of the mercantile community of Ceylon, and largely monopolize the gem trade.

Incidentally the fact that Solomon, when he wished to create a Red Sea fleet of traders, was under the necessity of building the required vessels with the aid of artisans brought from Tyre, proves that no Phoenician vessels were then trading in Asiatic waters, none of which could be chartered for the voyage to Ophir. This of itself shatters the great and hoary myth of a wide extension of Phoenician commerce to India and beyond. It also furnishes definite proof that no direct sea-trade with India had existed before c. 950 B.C.

SEA-TRADE IN EARLY TIMES

The Phoenician design of Solomon's ships marked a new era in Red Sea naval construction. No longer was the frameless design of Ancient Egypt the accepted standard ; the employment of Phoenician shipwrights introduced the use of supporting frames, thereby enabling depth and cargo space to be increased together with a reduction in the beam ; the vessels became more weatherly and better fitted to engage in voyages of protracted duration.

After Solomon's brief incursion into oversea trading, we find no records of ship traffic in the Red Sea until the final brief revival of native Egypt under the Saitic Pharaohs Psamtik I (663-609 B.C.) and Necho (609-593). Under these enlightened and vigorous rulers the country recovered much of its ancient power ; both freely employed Greeks and Phoenicians in their service, the Greeks in the army, the Phoenicians together with Greeks in the navy. Both peoples had the sea in their blood ; influence from these quarters must have been one of the main factors in the formulation of Necho's scheme to provide facilities for the conveyance of commodities between the Mediterranean and the Red Sea by re-opening the Middle Empire canal through the Wadi Tumilat. Ordered to desist by an oracle or influenced by the warning of his engineers that the higher level of the Red Sea (as supposed to exist) above that of the Mediterranean would involve the flooding of the Delta, the scheme was abandoned after an immense amount of work had been done. Instead, Necho decided to test the possibility of circumnavigating Africa. According to Herodotus this feat was actually accomplished. Necho's ship, officered and presumably manned by Phoenician seamen, was duly despatched, southbound down the Red Sea. Eventually it returned to Egypt through the Mediterranean, after a voyage lasting nearly three years, its reality vouched for by the fact, scorned by Herodotus, that on the second half of the voyage the sun rose on the right hand. Doubt and denial are often expressed today of the truth of this tale, but from what is known of the long voyages of the Polynesians to Easter Island, New Zealand and elsewhere and of those of the Javanese to Madagascar some 2,000 years ago, I see no valid reason to scorn the possibility of seasoned Phoenician sailors carrying through such a venture if favoured by exceptionally favourable conditions of winds and currents so long as their hearts failed them not.

After Necho's time all attempts to open up oversea trade in the Indian Ocean were abandoned by the Egyptians, control of the trade communications with the Orient remaining with the Sabaeans, seated in the ports of southwest Arabia. Thence resorted trading vessels from

ANTIQUITY

India, and the south coast of Arabia, from Oman, and some ports in the Persian Gulf, their cargoes unladen and sent by caravan northward to the Nabataeans of Edom—the second series of middlemen distributors.

With the conquest of Egypt by Darius of Persia in 525 B.C. Ancient Egypt comes to an end: sea traffic inspired by native Egyptians is never heard of again. Once the country was pacified Darius conceived a scheme for the opening of a direct sea-route between the two greatest lands under his rule—Persia and Egypt. To this end he despatched an exploring party under the Greek Scylax of Caryanda, to survey the coastline and havens of Arabia from the mouth of the Euphrates round to Suez, a voyage successfully accomplished. As an essential complement to this commercial scheme Darius resumed and completed the Nile-Suez canal begun by Necho; had he lived longer the trade route thus planned would have anticipated by several centuries the trading enterprises of the Alexandrian Greeks, first under the Ptolemies and later under the Caesars. This story of the gradual opening up of direct trade with the Far East is too well known to require detailing. Suffice it that with the rise of Greek supremacy under Alexander, Greek commerce became dominant and what the Sabaeans had done previously in a small and ineffective manner to exploit Indian sea-trade was taken up and developed by the Greeks to enormous dimensions, particularly in later days, in their enterprising endeavour to satisfy the needs of Roman extravagance. The indulgence of Rome in ostentatious competition by the wealthy in the squandering of money on foreign luxuries and rarities was the ultimate factor that in the last century B.C. finally brought about the opening of the sea gates of India, which had been assailed intermittently after the explorers sent out by Darius and Alexander had demonstrated the vast possibilities of direct, long-distance sea communication, and its immense advantages over a combination of coasting voyages and desert caravan traffic. Alexander may justly be counted the father of sea-trade between East and West.

INDIAN SEA-TRADE IN EARLY TIMES

So far we have written as though India herself had been passive in regard to sea-trade to and from her ports—a looker-on upon the brave and venturesome doings of other nations and races. This is but partially true, and arises from the fact that her own sea-traffic was in the main coastwise within her own boundaries and what portion was oversea traffic was far more largely directed to the east than to the west. Greek and Graeco-Roman traffic with India was restricted almost entirely

SEA-TRADE IN EARLY TIMES

to the west coast and as our only definite knowledge of ancient Indian trade is derived from Greek and Roman writers, Indian trade with the Malay Archipelago and Peninsula has failed to receive adequate notice. There are, however, a few definite indications that there was considerable indigenous maritime activity to and fro across the Indian Ocean from a very early date. There are passages even in the Sanscrit epics, the Mahabharata and Ramayana, containing allusions to voyages to other countries by sea, but these are vague and undatable and merely tell us the fact that several centuries B.C. sea-trade was vigorously carried on.

More definite are some Buddhist legends embodied in the *Pitakas* and *Jatakas*, particularly the latter, dating from the late centuries B.C. Among the former, the *Sutta Pitaka*, attributed by Rhys Davids⁶ to the fifth century B.C., tells how, 'long ago', merchants when sailing on oversea voyages out of sight of land, carried with them 'shore-sighting birds' which were used to locate the nearest land when the ship's position became doubtful. The same custom is related by Pliny,⁷ as practised by the seamen of Ceylon when making sea voyages, 'as they are unable to steer by the stars'.

Another passage of this *Pitaka* mentions voyages lasting for six months, made in ships which were brought ashore and laid up during the winter, a custom curiously similar to that practised until recently by the Sinhalese owners of the antique sewn-plank craft called *Yatra oruwa* (FIG. 4).

Still more valuable is the evidence of the *Jatakas*, which may go back as far as 400 B.C., but which enshrine folk tales of much greater antiquity. The most important is the *Baberu-Jataka*,⁸ wherein we read of Indian merchants who made periodical voyages to Baberu (Babylon). The story as told is dressed fantastically, but there can be little doubt that it has as its basis the tradition of regular trade by sea between Western India and the Babylonian river-towns, carried on by Indians and comprising peacocks as one of the articles of export from India. This trade probably existed from much earlier times, for other *Jatakas* make much mention of the seaports of Bharukaccha (Broach) and Surparaka (Supara), and of long and perilous oversea voyages made therefrom to distant lands—to Suvarnabhumi in particular, which appears to be that Farther India we now call the Malay Peninsula.

⁶ *Jour. Roy. Asiatic Soc.*, April 1899, p. 432.

⁷ Pliny, *N.H.*, VI, 22

⁸ *Jatakas*, Cambridge edn. 1907, III, 83.

ANTIQUITY

The discovery of Indian timber in the Babylonian ruins of Birs Nimroud and of Ur (Mukayyar) in buildings dating *c.* 604–538 B.C.⁹ furnishes conclusive evidence of sea-trade conducted in fairly large vessels between India and the Euphrates at this early period. This sea-trade with Babylon, operated in Indian ships, cannot be less ancient than the sixth century B.C., and is possibly a good deal older. Its continuation in Achaemenid times is rendered probable by the discovery of Indian artifacts in the ruins of Susa consisting of libation cups, bangles and ornaments made from the Indian *sankha* or chank, fished even yet in quantities on the Kathiawar coast.¹⁰ The age of these ruins brings Indian trade with Persia into the fifth century B.C., but some of the ornaments—one bangle in particular, obtained from a lower stratum—belong probably to a much older period, for Susa was a capital of the Elamites long before the Achaemenid occupation of the site. I have also identified carved chank ornaments from Tello, the ancient Lagash, in the Louvre Museum.

Commercial relations in Indian bottoms were undoubtedly carried on with Muza and Aden in very early times. Probably the earliest distinct record of this is the notice by Agatharcides of Alexandria who, about the middle of the second century B.C., saw large Indian ships arriving at a Sabaeen port from Patala on the Indus. He notes how wealthy the Sabaeans had become by reason of their country being the exchange centre for Indian goods so brought by sea. This direct Indian trade is confirmed by the story told by Eudoxus, who himself twice voyaged to India towards the end of the second century (118–112 B.C.) This related how an Indian ship had been found derelict off the entrance to the Red Sea with one famished Indian sailor alone alive. This man, brought to Egypt by the coastguard, subsequently offered to show the route to be followed on the voyage to India and acted as pilot of the first trading expedition captained by Eudoxus.¹¹ Probably the sailor utilized the monsoon winds and set a direct course to some port in India—possibly this was the first hint the Egyptian Greeks received of the regularity of the monsoons and thus prepared the way for the so-called ‘discovery’ alleged to have been made by Hippalos in the first century A.D.

Of Indian sea-faring in our own era I shall not now treat except to mention that the author of the *Periplus of the Erythraean Sea* states

⁹ J. Kennedy, *J.R.A.S.*, 1898, p. 267.

¹⁰ J. Hornell, *Marine Zoology of Okhamandal*, pt. II, p. 2, London, 1916.

¹¹ Strabo, *Geog.*, II, 3, 4.



MODEL OF A MTEPE FROM FAZA, LAMU ARCHIPELAGO (see p. 250)
by courtesy of the Science Museum, London

SEA-TRADE IN EARLY TIMES

definitely that Indian ships traded regularly with Apologos, at the head of the Persian Gulf, and with Ommana, a port on the south coast of the gulf ; he notes as among the principal items of trade—logs of sasamina,

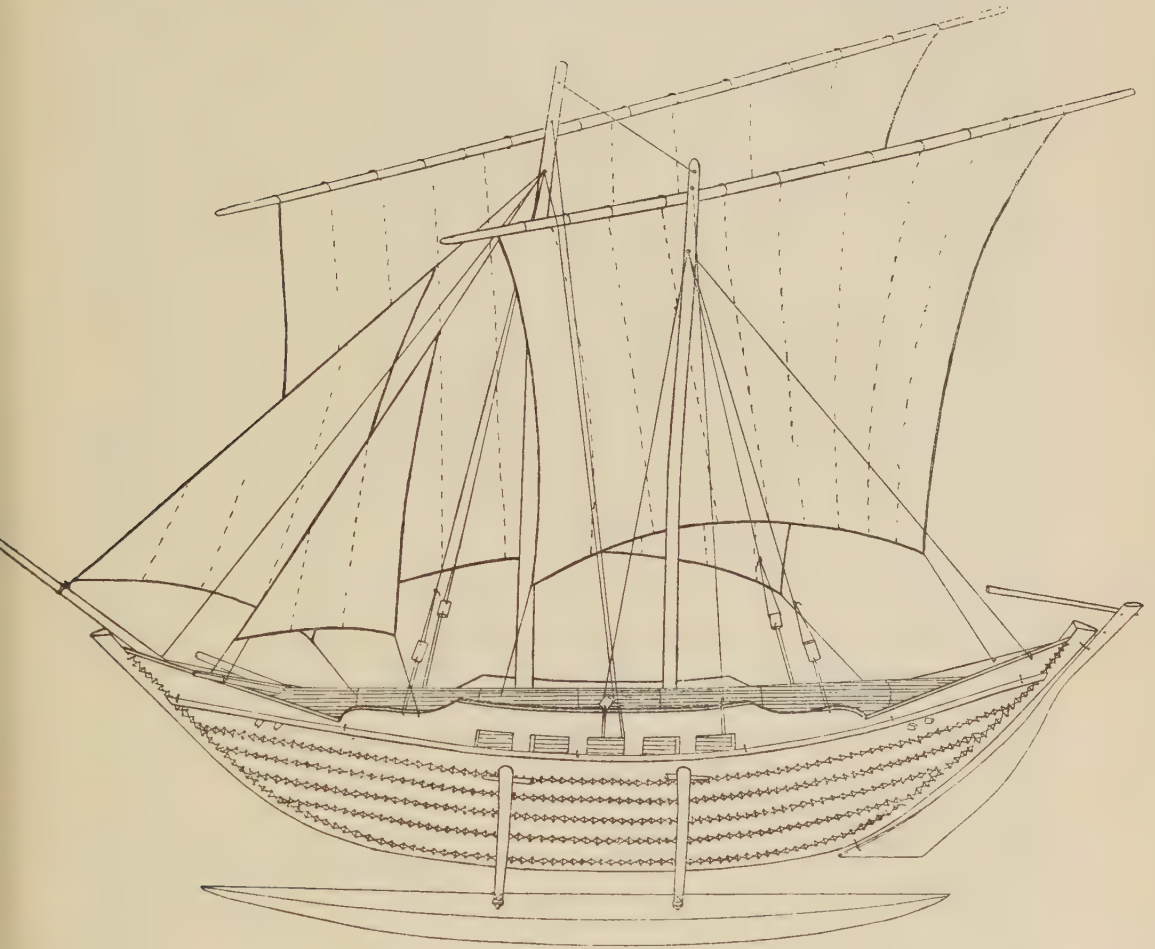


FIG. 4. A SINHALESE OUTRIGGER COASTER

This type was still in use in the early part of this century. All parts of the hull are 'sewed' together with coir twine (original) (see p. 247)

ebony, sandalwood, and wood for rafters (teak?), copper and other commodities. He adds that Ommana is a shipbuilding centre, exporting completed vessels called *madarata* to Arabia, meaning Hadhramaut

ANTIQUITY

and Yemen. An identical trade exists now in the export of timber (teak) from the Malabar coast to supply the needs of the many ship-yards on the Arabian coasts.

It is of great interest to note that Glazer derives the term *madarata* directly from the Arabic *muddarra'at*, meaning 'fastened with palm fibre'. If correct this exactly describes the outstanding feature of indigenous ship construction on the Indian, Arabian and East African coasts until European influence wrought a revolution. Marco Polo (13th century) records it as a characteristic of the Perso-Arab ships of Ormuz; the author of the *Periplus* (1st century), Vasco da Gama (15th century), and Capt. W. F. W. Owen (early 19th century) have all noted the same method of construction as in use in their times on the east coast of Africa. Today the masula boat of Madras is built after the same manner as was also the fine square-rigged *Mtepe* of the Lamu Archipelago until it became extinct a few years ago (see PLATE).

The sea-trade of the east coast of India never became well known to the Alexandrian Greeks or to the Romans; on the other hand much more information upon this aspect of ancient Indian enterprise is contained in inscriptions and documents than in the case of the west coast trade. The records of Indian and Sinhalese dynasties frequently mention naval expeditions against oversea nations. Vijaya and his followers, the progenitors of the Sinhalese people, are reputed to have reached Ceylon about 550 B.C. from a port at the head of the Bay of Bengal. For centuries thereafter South Indian inscriptions and Sinhalese chronicles testify to the frequent invasion of Ceylon by Chola and Pandyan forces and even to occasional counter-invasions of South India by Sinhalese. Boats of considerable size were employed, as mounted troops are mentioned; horses, elephants and chariots also passed as marriage gifts between the royal houses of South India and Ceylon.

Extension of Indian overseas communications was particularly active in the time of Chandragupta, a great warrior statesman brought to the front by the impact of Europe upon India. In his day great progress was made in the development of intercourse with the Far East; it is probable that at this time (c. 300 B.C.) Hindus began to found settlements in Java, Sumatra and Cambodia and to introduce Brahmanism into those countries. Trade with Chavakam, meaning Sumatra and Java, is alluded to in several old Tamil poems quoted by Kanakasabhai Pillai in his *Tamils 1800 years ago*. Sometimes the current set the other way, for Abu Zaid (c. A.D. 916) relates a story of an invasion of the Pandyan country by the Maharaja of Java, incidentally

SEA-TRADE IN EARLY TIMES

mentioning that it was about ten days sail between the two kingdoms, 'but when the wind is light the journey may take as much as twenty days'; for Java, Sumatra should here be read. There are besides frequent references to countries on the northern and eastern shores of the Bay of Bengal and to Sumatra and Java farther east, in the oldest classical writers of South India; these show conclusively that inter-communication was easier and far more frequent than is usually realized and this infers the use of large and seaworthy vessels.

From very early days trade between Ceylon and Bengal was important. The chank-shells for the bangles esteemed so necessary by Hindu ladies in Bengal were obtained entirely from the South Indian and Ceylon fisheries, and the muslins of Bengal returned in exchange. Fa Hian, the Chinese Buddhist who travelled in India between A.D. 399 and 414, is one of the first writers who specifically mentions this shipping route in ancient days; in a passage describing his pilgrimage to see the Buddhist relics in the possession of the Sinhalese he relates how he sailed from the mouth of the Ganges to Ceylon in 'a great merchant ship'. In 673 this port, Tamralipta or Tamluk, near the modern Midnapore, was found still prosperous by the later pilgrim I-Tsing, who there embarked when returning to China.

The most conclusive proof of the high development of purely Indian oversea trade in ancient times is afforded by the great colonizing epoch of the first seven centuries of our era. Within this period, at ill-determined dates, several waves of colonizing energy carried large bodies of Indians from the northwestern shores of the Bay of Bengal—Telugus from Telingana, Klings from Kalinga, and a Magadha element from Bengal—to Pegu and the Tenasserim coast, to Sumatra, Java and Cambodia. Other emigrants sailed from South India and Gujarat. The written records have gone, tradition is scanty and unreliable, but stone monuments remain in plenty, and in unrivalled magnificence that bears silent witness to Indian inspiration and workmanship.

THE INDONESIAN MIGRATIONS TO MADAGASCAR

Scarcely anything is known of this great series of emigrations beyond the bare fact that large ships set sail from Java and Sumatra at various times during the first millennium of our era, bearing large numbers of Indonesians across the Indian Ocean to found settlements in Madagascar. When these took place we do not know, nor yet their cause; the probability is that the earlier voyages were occasioned

ANTIQUITY

indirectly by the impact of Indian civilization upon the peoples of the Malay Archipelago. This appears to have caused an outburst of many-sided energy among the inhabitants of the large Western Islands comparable to that which followed the infusion of northern blood into the people of Mycenaean culture in Greece in pre-classic days. Whatever the cause, we find these Indonesians building great two-masted ships, fitted with double outriggers such as we still see in use in eastern Indonesia today. Two quarter-rudders as used in the larger sailing craft of the Bugis of Macassar were also used, and the rectangular oblong sails set obliquely on bipod masts were similar in all respects to the rig still *uniquely* characteristic of the Indonesian rig. Many vessels of this type are to be seen on the sculptured panels of the great Buddhist stupa of Boro Budur in Java, built in the 8th or 9th century A.D. (FIG. 5). The south-east trade-wind and the equatorial current running westward favour rapid and easy voyages direct to Madagascar across the Indian Ocean but there are reasons to believe that some of the voyages—there were at least two great migrations, separated by several hundred years, apart from occasional single voyages between the major migrations—were coastwise viâ Ceylon, Aden and the east coast of Africa, use being made on this route of the monsoon winds.

These Indonesian settlers in Madagascar were inveterate slavers. At frequent intervals they raided the African coast, returning with thousands of negro slaves belonging to various tribes speaking diverse languages and dialects. As late as the beginning of the nineteenth century the Sakalavas of the northwestern coast were accustomed to raid the Comoro Islands intermittently: Capt. Owen records one such raid in which 3,000 slaves were captured.¹²

Today the entire native population of Madagascar speak Malagasy irrespective of the somatic relationship of the speakers—it is spoken both by people of more or less pure Indonesian stock of definitely Mongoloid affinity and by burly crinkly-haired negro people, purely African in their physical characteristics. The Malagasy language as we now know is closely related to Kawi, the ancient speech of Java, so we are presented with the problem of finding an explanation for the strange fact that the negro tribes of Madagascar should have lost their own language although their numbers greatly exceed those of the stranger people whose language they have adopted.

¹² Capt. W. F. W. Owen, *Narrative of Voyages to explore the shores of Africa, Arabia and Madagascar*, p. 373, London, 1833.

SEA-TRADE IN EARLY TIMES

Had negro tribes been in occupation of the island when the Indonesian settlers arrived, it is unbelievable that all should have abandoned their own language or that it should not have modified to some extent that of the incomers. The answer, in my opinion, must be sought solely in the close association between the two races entailed by the practice of slavery on a great scale by the Indonesians. Judging from the strong slave-raiding propensity of the people of Madagascar,

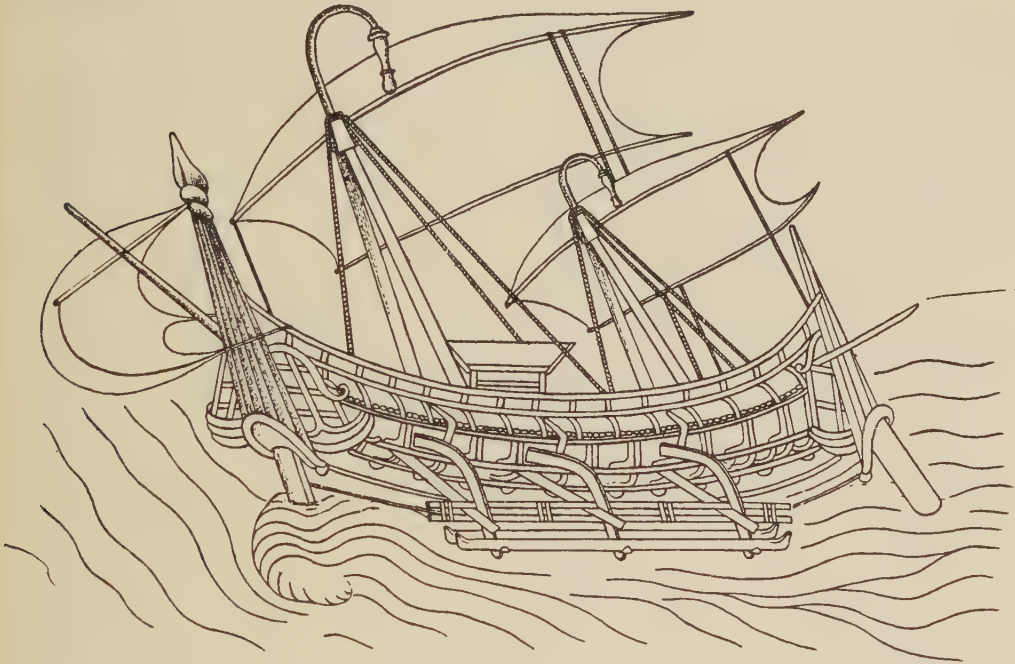


FIG. 5. A LARGE JAVANESE SHIP OF THE 8TH OR 9TH CENTURY A.D. FROM THE BORO BUDUR SCULPTURES, JAVA (see p. 252) (Original restoration)

exercised as we have seen until well into the nineteenth century, the ancestors of the African elements in the present population must have arrived in the island as slaves. Belonging to tribes of different languages, as we may safely presume was the case, the speech of the slave-owners would of necessity become the *lingua franca* of communication between masters and slaves ; in the course of time it would become the universal and sole speech of the whole population. We see the same phenomenon in the New World ; because of parallel conditions the languages of

ANTIQUITY

American negroes conform to those of the men who held their forefathers in the bonds of slavery. In the United States and Jamaica, English is the speech of the negro population ; in Brazil, the negroes speak Portuguese ; in Spanish America they talk a corrupt Castilian, and in Haiti it is French.

CHINESE TRADE IN THE INDIAN OCEAN

The Chinese trade by sea with the West now comes into view ; it is noteworthy that the Arabs (? Yemenites) held commercial relations from quite early times. We find from Chinese annals that even about A.D. 300 enterprising traders from the southern Arabian coast had established a colony at Canton, but we do not know in what ships they voyaged to China. Somewhat later (end of fourth century) we hear of Chinese travellers in India and Ceylon who used both Indian and Chinese vessels—probably Chinese to some port in the Malay Peninsula and thence to India in Indian ships.

It seems that the commencement of regular sea-trade between China and India cannot date back beyond the middle of the fourth century A.D. The first direct intercourse between China and India is ascribed to the early years of the Eastern Tsin dynasty (317-420). The earlier phase of this trade appears to have been conducted in a combination of Arabian, Indian and Chinese ships, which gave way in great measure to the larger Chinese junks as soon as the Chinese began to appreciate the immense value of India and Persia as markets for their goods.

Probably the earliest notice of Chinese vessels in Indian waters belongs to the first half of the fifth century when, according to Hamza of Ispahan and to Ma'sudi, the ships of India and China were constantly to be seen moored as high up the Euphrates as Hira, near Kufa, a city lying some 45 miles southwest of Babylon.¹³

As Yule points out, after this a gradual recession took place in the location of the terminal port of Chinese traffic in their sea trade with the West.¹⁴ From Hira it descended to Obolla, the ancient Apologos ; from Obolla it was transferred to the neighbouring city of Basra ; next to Siraf on the northern shore of the Gulf, and from Siraf successively to Kish and Hormuz. Chinese annals of the T'ang dynasty of the 7th and 8th centuries describe the course followed by their junks in the

¹³ Yule, *Cathay and the Way Thither*, I, 83, London, 1915.

¹⁴ Yule, *loc. cit.*, p. 87.

SEA-TRADE IN EARLY TIMES

voyage from Kwang-chau (Canton) to the Euphrates. It also appears that Chinese ships in equally early times voyaged to Aden.

By the 12th century the farthest port of exchange resorted to by Chinese vessels appears to have been Debal, the then most famous port in Sind—probably Karachi. Al Idrisi describes it as a station whither came 'ships laden with the productions of U'man and the vessels of China and India'. Baruh (Broach), he also states, was a port for the vessels coming from China as also for those from Sind.

From this time onwards until the early part of the fifteenth century, contemporary notices of Chinese trading ships calling or loading at Indian ports become frequent.

The chief Indian ports resorted to by Chinese junks during the 13th and 14th centuries appear to have been Kayal on the Gulf of Mannar, Quilon in South Travancore, with Calicut and the fine bay south of Mount Deli in North Malabar. On the site of 'the noble city of Kayal', which had ceased to be a seaport before the arrival of the Portuguese about A.D. 1500, owing to the silting up of its harbour, I have found innumerable fragments of Chinese celadon pottery, much of it thick and coarse and suggestive of the type of pots used for preserved ginger—a sweet-meat greatly loved by Indians. Here Marco Polo landed at the end of the 13th century, and it is he also who mentions Delai (Mount Deli) as a place where 'the ships of Mangi come'. Quilon he mentions, but not as a terminal port for Chinese ships, though from other sources it is obvious that this port was used as a clearing house by Arabian and Chinese traders. In the long intercourse between China and India it is plain that with altering circumstances—the wane of one sea power and the rise of another, to say nothing of mercantile changes—a port occupying the premier position in one century might be supplanted in the next by some other. Kayal, Quilon, Calicut, and Deli are four regarding which we have clear evidence.

In passing it is notable that early in the 13th century a large Chinese fleet brought to the Malabar coast several hundreds of Chinese immigrants who remained in the country for trade and industry. Abd er-Razzak in the 15th century (1442) speaks of the sea-faring population of Calicut being called *China bhachagan* (China boys), which can only mean that the Mapilla population had then a strong Chinese strain in it. We also know from Chinese authorities, as well as from the Sinhalese chronicle *Rajawaliya*, that the Chinese sent a powerful naval force under the eunuch Cheng Ho against Ceylon in the beginning of

ANTIQUITY

the 15th century, an expedition which resulted in the capture of the Sinhalese king Vijaya Bahu II and his deportation to China.

The best contemporary description of the Chinese vessels that traded to the West is that of Marco Polo, who sailed with a small fleet of junks from China to India and Persia at the end of the 13th century.

How, and exactly when, Chinese trading fleets ceased to frequent Indian waters is something of a mystery. Nicolo Conti's description of the great trading ships seen by him in Indian seas is, so far as I know, the latest surviving account of the Chinese junk trade with India. He describes them as having five masts, and with the lower part of the hull constructed of triple planking and some ships provided with watertight bulkheads. His description follows so closely that of Marco Polo that I am inclined to think that he had Marco's *Travels* before him when he wrote the account.

It is certain that no Chinese ships were in the Indian trade when the Portuguese arrived in India in 1498; the increase of piracy on the West Coast of India and the jealousy of Gujarati and Arab trading interests may have been the main factors in the discontinuance of the Chinese junk trade with India and the Persian Gulf.

Mirrors

by DR BRUNO SCHWEIG

A STORY from Corea called 'The Magic Mirror' tells us that a young peasant went from his village to the capital in order to sell his products and to buy some commodities. Passing a shop-window he was struck by having seen somebody in the window who could not have been anybody else but his twin-brother. He was amazed at this because his brother was living in another town. He stood still and gazed, and now he was sure that it was his twin-brother, because when he smiled at him he smiled back. 'I must have this magic', he thought. So he entered the shop and asked whether he could buy this strange thing in which was to be seen his counterpart. The shopkeeper wrapped it up and remarked laughingly: 'Be careful not to crack it, so that your brother will not get lost'. The peasant took it home, but before he could unpack it to show his family he was called away on urgent business.

So it was his mother-in-law who, anxious to know what her son had bought, became the first to look at it. She saw an old woman and cried out: 'What on earth has come into his mind to bring this woman with him from the town'! She called her daughter, who came with her baby in her arms. She looked at the thing and became furious at once: 'Oh, he has bought another wife from the town and a child as well. How will he be able to feed us all? Two wives! That will not do. My brother must come'. The brother came and when he, with his sister and mother, looked at it, they found a whole family, and the brother said: 'It is clear, he has brought another family and will get rid of us'. So, when the peasant returned home they started shouting at him, making violent accusations. Eventually they went to the judge. He asked for the mysterious thing in which were all the folks and, when it was brought, immediately found out that it was, of course, a mirror. It took him much pains to explain that they saw the images of themselves, and it was only after some time that he succeeded in reconciling the family.

This little story shows that even at a time when mirrors could be bought in shops the writer of the story quoted thought it probable that

ANTIQUITY

people existed who knew nothing about looking-glasses and the possibility of images of themselves. It makes it clear to us that the human intellect must have been developed to a comparatively high degree, before it could conceive the idea of a reflected image. That is probably the reason why we find mirrors relatively late in the history of mankind. It also throws some light on the origin of all these tales where human, or semi-human beings like mermaids, nymphs, etc., are thought to exist in the water. The image dimly seen in the floods, but not recognized, may have been the cause of the imaginative beliefs.

The English language has three words for a surface reflecting an image: looking-glass, mirror and speculum. The word reflector, which one could be tempted to add, does not create an image as a rule, and has a different meaning.

'Looking-glass' is self-explaining and applies only to the special kind made of glass. 'Mirror' and 'speculum' are the two general expressions; 'speculum', however, is nowadays chiefly used for optical or surgical instruments, especially where metal is concerned.

'Mirror', or 'mirour' as it was written in the 18th century and even later, comes from the old French word *mirour* which was preceded by *miradour*. This originates in the late Latin *miratorium*, from *mirare* = to look at, to behold, an offspring of the classical Latin *admirari* = to wonder, admire (compare miracle).

'Speculum' is also taken from the Romans who used it in the same sense, from *specere* = to look, to observe.

These two words, mirror and speculum, or their derivations, are found in all European and related languages but that of the Slavs: in French *miroir*, in Dutch and German *Spiegel*, in Danish *Spejl*, in Norwegian *Speil*, in Swedish *Spegel*, in Italian, *spècchio* and in Spanish *espéjo*.

Though, of course, not so universally used as they are today, mirrors were already well known several thousand years ago, in quite different parts of the world. Once the idea of the mirror was conceived, doubtless by looking at the calm surface of a pool, pond, well, lake or river, other mediums more suitable for indoor purposes were searched for. Metals, first gold and silver, then alloys of tin and copper, often with additions of arsenic to increase the whiteness, were used. A glassy rock, obsidian, found in the vicinity of volcanoes, was polished into a mirror. It is an impure semi-transparent stone, varying in

MIRRORS

colour from grey to black. The chemical composition is essentially the same as that of granite. The fact that one consolidated at the surface, rapidly and under low pressure, while the other cooled slowly at great depth and under such pressure that the escape of the steam and other gases it contained was greatly impeded, produced the marked difference in their physical conditions. Another transparent or translucent kind of stone, phenacite, was also employed. It is probably crystallized gypsum.

Who were the first to use these materials as mirrors is difficult to decide. In the tombs of old mummies in Peru, mirrors made of a vitrified stone like obsidian were discovered, some concave, some convex, also mirrors made of Incas-stone. This is a compact pyrite, or marcasite, capable of a very brilliant polish and still used for ornaments, because it looks like white bright steel but never rusts, a very suitable stone for a mirror. Similarly, mirrors of obsidian were extensively employed by the ancient Mexicans, who quarried the stone called 'itzli' at the Cerro de la Navajas or 'Hill of Knives' near Timapan.

The Chinese seem to have used mirrors, even of glass, more than 2000 years B.C., as mentioned in the Chinese classics. Unfortunately we do not know much more than that of the mirrors of Old China. Some bronze mirrors of the Han dynasty, showing the fine pattern, are reproduced (FIGS. 1, 2).

Among the Japanese the metal mirror held a most prominent place, and was thought so important as to have been almost an object of worship. It was considered an emblem of the soul of woman, and at least two mirrors were included in every bride's trousseau. These mirrors, most of them convex, were generally made in bronze, polished by amalgam and very highly ornamented or engraved on the back. In Japanese life and legend the mirror is one of the most characteristic features, hence the story from Corea. The so called 'Magic Mirror of Japan' not only reflects the onlooker's own face, but when held to the light in a particular manner throws bright-lined images from its polished surface on to a screen corresponding to the figures on the back. This seems impossible, but these mirrors are manufactured in a way that the ornaments of the back were originally also visible on the front. They were then ground and polished away, leaving only invisible inequalities of curvature and thickness, or density, of the metal, yet enough to cause the amazing reflections. Superstitious people could be brought to the belief that everything could be seen in these mirrors, the past as well as the future.

ANTIQUITY

Egypt is the land whose mirrors are the best known of the ancient cultures. Obsidian was employed as well as metals, and later on glass. In the museum of Turin are two little glass mirrors framed in wood and fixed at the base of small Egyptian figures in white stone. In the excavations at Sakkarah some of these little mirrors were found, being slightly convex, round, and all framed at the bottom of pottery figures. Though by reason of their fragility very few have been preserved, yet enough remain to show that mirrors of glass were well known. In imitation of obsidian it was chiefly black, opaque glass, reflecting from the front, and not of a high perfection. Therefore, metal mirrors were generally preferred. They were mostly oval in shape, with a handle, and decorated with ornaments and signs.

From the Egyptians the art of mirror-making passed to the Phoenicians, and also to the Hebrews. Little is known of Phoenician mirrors, but a mirror found at Cyprus and in the New York museum, is attributed to the Phoenicians. The disk-mirror was fixed at the head of the cymbal player, who was apparently supposed to be placed on a table. Of the Hebrews we read in the Pentateuch that Moses collected mirrors of brass at the Tabernacle to make the brazen laver. That was about 1500 B.C.

Just to show that mirrors were found in every country wherever a higher culture had developed, we look again to the East. In Ceylon, according to the Mahawanso Chronicle of the Sinhalese kings, 306 B.C., 'mirrors of glittering glass were carried in procession'. The Burmese and Hindoo idols are, even to this day, often decorated by triangular mirrors arranged in pattern together with small pieces of coloured glass. Some figures so adorned must belong to a remote age. At Sidon in Syria, where it is said that the use of glass in the occidental culture sphere had its origin rather than in Egypt, mirrors of glass were manufactured, as mentioned by Pliny. One has been found at San Remo.

The miraculous properties ascribed to mirrors made them attractive not only to poets and magicians, as seen by the previously mentioned Corean and Japanese legends, or in 'Snow-White and the Seven Dwarfs', where the wicked Queen is consulting her magic mirror, but philosophers also found them useful; Socrates employed a mirror for moral instruction. He urged his pupils, we are told, to look at themselves frequently in the glass, that he might beg any of them who should be gratified at his own beauty not to spoil the dignity of the body by a dishonourable state of mind. The Greek tragedians, living

MIRRORS

at about the same time, frequently mention mirrors. Praxiteles, the sculptor, in 328 B.C. taught the use of silver in the manufacture of mirrors. Whether Aristotle has described the making of glass mirrors, as often stated, is not certain, no particular instance being given. Mirrors were unknown to Homer. Therefore we may assume that the Greeks became acquainted with mirrors, both metal and glass, about 600 B.C.

But it was nearly 2500 years later, in 1867, that the first specimen of a Greek mirror was discovered at Corinth. Others were found at Mycenae, at Ialysos, at Vaphio and in Crete, etc., but most of the Greek mirrors are from Corinth, though the number extant is comparatively small. They are hand-mirrors, usually provided with a handle, or 'box' mirrors, consisting of two metallic circular discs, fitting into each other and sometimes fastened together by a hinge. The best specimens of both kinds of mirror date from a little before 400 B.C. The mirror proper consisted of a thin disc of metal, mostly bronze, which was slightly convex and polished on one side. The other was left plain or showed a design. Usually the mirrors were highly decorated. The handle sometimes took the form of a statuette, especially of Aphrodite supported on a pedestal. Of the 'box' mirror the upper disc or cover was ornamented on the outside with a design on low relief; inside it was polished to form the mirror. The lower disc was decorated inside with engraved figures.

In the British Museum is a mirror from Crete on the back of which is shown a figure of Eros that has been silvered over. The bronze case used to contain it bears on the back a group of Aphrodite and Eros in relief hammered into it from the reverse side. Eros was a favourite subject for mirror decoration. A bronze mirror-case, found at Corinth, shows an Eros with two girls on the outside in relief; on the inside a nymph, playing with Pan on a beach, is incised. Another mirror, representing 'Ganymede carried away by the eagle', is estimated to be one of the best examples of relief.

Divination is also a purpose for which mirrors were used in Greece. At the Temple of Ceres at Patrae, when a sick person wanted to know the outcome of his illness, a mirror was let down into a well by means of a string, until it grazed the surface of the water with the rim. After a little while it was pulled up, and, when looked into, showed the face of the enquirer, alive or dead, so we are told. The oracle of Apollo near Cyanaeca also made use of the combination of a fountain with a mirror, where they believed it to be possible to perceive whatever they

ANTIQUITY

wished to behold. To impress the visitors to the Temple of Persephone near Acacesium a mirror was fitted in the wall of a passage reflecting dimly the face of the onlooker, but showing very clearly the goddess on the throne.

Similar to the Greek mirrors were those of Etruria in Italy. The extant examples far outnumber the Greek. The style of execution varies considerably according to the different dates, some of them being of a rude and archaic character, while others are among the most artistic treasures of our museums. Most of them belong to the 3rd and 4th centuries B.C., chiefly resembling the Greek disc-mirrors in form, box-mirrors being rare. The subjects of the designs incised on the back are, as a rule, taken from Greek mythology and legend (Trojan War, birth of Athena, Aphrodite and Adonis, etc.), or from the daily life, the toilet, the bath, the palaestra (gymnasium). The names of the persons represented are frequently added in Etruscan letters and orthography; Apul=Apollo, Achle=Achilles, Achmem-rum=Agamemnon. This may be taken as a proof of the Etruscan origin, although some may have been imported from Greece. But the Greek models are always followed, even where distinctly Etruscan figures are introduced, such as the heroes Aelius and Caelius Vibena on a mirror in the British Museum. Among the finest and most beautiful specimens may be mentioned the famous Semele-mirror and the Healing of Telephus, in which Achilles is shown scraping the healing rust from the lance with a crescent-shaped knife. Most mirrors were of metal, but glass was also used. Fragments of a circular glass mirror, foliated with a thin sheet of lead, have been discovered among the excavations at Lillebonne.

The Romans, well acquainted with the culture of the Greeks and the Etruscans, produced as a rule similar mirrors to these. Their mirrors were chiefly made at Brundisium, of a mixture of copper and tin, of zinc or silvered copper, and sometimes of pure silver. Others were of glass. The mirrors, mostly hand mirrors, were either plain or decorated in the Greek and Etruscan fashion. As metal mirrors easily tarnished, a sponge with powdered pumice stone was often fastened to the setting. We may note here that pumice powder is used to this day for cleaning and polishing purposes. Lucretius reports two opposite mirrors reflecting the image several times. Under the emperors the art developed and larger mirrors were manufactured. They were either fixed to the wall, or working up and down like a

MIRRORS

window sash. Some appear to have been large enough to take in the whole figure as described by Seneca, who also speaks of a mirror bevelled all over, repeating the image from all the facettes. Virgil praises the crystal pureness of a mirror as resembling 'the smooth clearness of the Fucian Lake'. Pliny described a semi-opaque glass mirror, let in a wall. In Pompeii a mirror of square black glass fixed to the wall by three holes has been found. The Emperor Domitianus, when he suspected that plots were formed against him, lined a gallery, in which he used to walk, with mirrors of phenacite to show everything done behind his back.

Wherever Roman civilization spread, the use of mirrors, some of them of a special kind, was introduced. The reflection was provided by glasses foliated with lead. These mirrors were surprisingly small, the glass part seldom being larger than 3 centimetres, so that it appears doubtful whether this kind was really intended for use as mirrors or as toys for children and for decorative purposes. These mirrors bear a striking resemblance to those manufactured in Germany about ten centuries later. Most of the mirrors brought to the Roman provinces were, of course, of metal. A mirror found at Desborough (FIG. 5), now in the British Museum, shows that the Celtic population of England had made excellent mirrors before the Roman conquest. This example, enriched with an incised Celtic pattern, exhibits native originality by the shape of the handle. Of the very few bronze mirrors found in Britain, the backs are, curiously enough, engraved, as are the Etruscan mirrors, not cast or stamped (FIGS. 3, 4).

Summarizing, we may say of this period that the Romans used all available suitable materials for mirrors—natural stones, glass in its opaque form, reflecting from the surface, or, when transparent, foliated with tin, lead or alloys. Polished metal, however, was the most widely employed medium. The same methods were in use for some centuries to come, until the improvements in glass-making resulted in its predominance.

If the Middle Ages are taken to comprise a period of a round thousand years from about A.D. 500–1500, we find a noticeable change in the manufacture of mirrors during that period. Looking-glasses were known, but metal mirrors were more generally used, so that it seems as if the art of making mirrors of glass was sometimes lost for several centuries. At the very end of the Middle Ages a new method, the foliating of glass with tin-amalgam, revolutionized the manufacture

ANTIQUITY

of mirrors and gave a new impetus to the art, widening the field of its employment to a degree hitherto unknown.

The following quotations, scanty as they are, indicate the use of both metal and glass in the course of the thousand years, and in different countries. In 625 Pope Boniface IV sent Queen Ethelberga of Northumbria a present of a silver mirror. Isidore, Bishop of Seville, who died A.D. 636, says of glass: 'There is no material better adapted for making mirrors'. On many of the sculptured stones of Scotland, belonging probably to the seventh, eighth and ninth centuries, representations of metal mirrors, mirror-cases, and combs occur. In England, in the early times of the Anglo-Saxons, mirrors, presumably of metal, were well known. About 1100 Alhagen, the Arabian, wrote his treatise on optics, and as he speaks of iron and silver mirrors, but never mentions glass, the art of making looking-glasses must have been forgotten some time after Isidore, or could not have come into common use.

In the wardrobe account of Edward I the item occurs of 'a comb and a mirror of silver gilt'. About the same time Vincent de Beauvais, writing in 1240, in France, says that the mirror of glass and lead is the best of all — 'quia vitrium propter transparentiam melius recipit radios'. (As glass because of its transparency best receives the rays). The English Franciscan Friar Johannes Peccan also mentions glass-mirrors, and says they were covered on the back with lead, no image being reflected if the lead was scraped off. Roger Bacon gives a similar description.

A guild of glass-makers existed at Nuremberg as early as 1373. Among other objects small convex mirrors were made there in large quantities and continued to be made until comparatively recent times. They were known as 'Bull's eyes' (*Ochsenaugen*). Small globes of glass were blown, into which, while still hot, was passed through the pipe of the glassmaker a mixture of lead or tin, antimony and tar or colophony. When the globe was entirely coated with the metallic compound and cooled, it was cut into small convex pieces of relatively perfect mirrors. Whether there is any relation to the similarly manufactured small Roman mirrors, mentioned above, we do not know. Three Venetians, one of them Nicolo Corro, were cheated as early as 1317 by a German, a 'magister of Alemania' who broke his agreement to instruct them in the making of glass mirrors, leaving in their hands a large quantity of useless alum and soot. It will be remembered that the other methods of making glass mirrors consisted in coating with metal either by sticking or pouring molten tin or lead on to the



FIG. 1. CHINESE BRONZE MIRROR, HAN DYNASTY (see p. 259)
left: handle of hand-mirror; *right*: belt-mirror with gold, silver and turquoise inlay
British Museum



FIG. 2. CHINESE BRONZE MIRROR, HAN DYNASTY (see p. 259)
British Museum

PLATE II

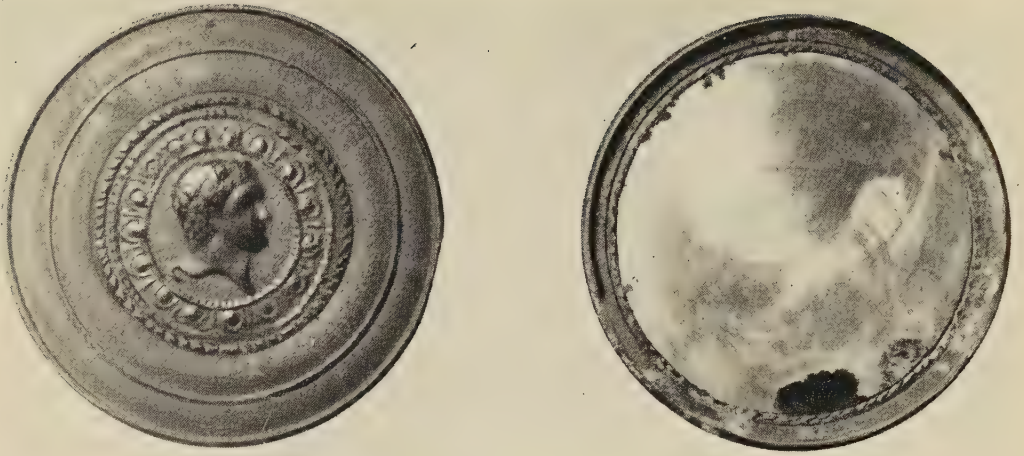


FIG. 3. ROMAN BRONZE MIRROR (see p. 263)
British Museum



FIG. 4. ROMAN POCKET-MIRROR FROM CODDENHAM, SUFFOLK (see p. 263)
British Museum

PLATE III

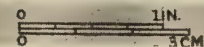
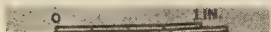
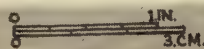
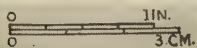


FIG. 5. BRONZE MIRROR, WITH ENGRAVED BACK, FROM DESBOROUGH,
NORTHANTS (see p. 263)
British Museum



FIG. 6. VENETIAN MIRROR, 16TH CENTURY:
OVAL PLAQUE FROM BACK (see p. 268)
British Museum

PLATE IV



FIGS. 7-10. ENAMELLED GOTHIC AND RENAISSANCE MIRROR BACKS (see p. 265)
 Top left: French mirror, late 14th cent.;
 right: Flemish or North French, late 15th cent.
 Bottom left: French, late 16th cent.;
 right: French, 15th cent.

British Museum

MIRRORS

glass. This latter method, was, for instance, mentioned by Raimundus Lullius, and described by Conrad von Wegenberg in his book on Nature. This process is said to have been in use in Germany and elsewhere until the middle of the sixteenth century. A mirror of gold, with figure subjects, enamelled and garnished with pearls, is entered in the accounts of the Duke of Burgundy for 1389. In the same account are mentioned a great number of gold and silver mirrors, some of which were richly chased, enamelled and jewelled.

Most of the mirrors used during the Middle Ages were small. That is easily understood, where metal is concerned, and as to glass, the art of making large sheets was not yet discovered. For it was not till 1350 that enough flat colourless glass was supplied by a glass maker of Chiddingfold to glaze the windows in St. George's Chapel, Windsor, and the chapel of St. Stephen's, Westminster. Not before the fifteenth century was glass more generally used for windows, the substitute having been shaved horn, parchment and sometimes mica. All these materials were unsuitable for the making of mirrors, for technical and artistic reasons.

In the fifteenth century, mirrors of glass or crystal are occasionally represented in Flemish pictures. For example, in Van Eyck's portrait of Jan Arnolfini and his wife, painted in 1434, a convex mirror on the wall clearly reflects the room's contents. This was obviously a specimen of a mirror of comparatively large size, but such mirrors were rare.

Pocket-mirrors, however, and small hand-mirrors, were largely used during the Middle Ages. The pocket-mirrors consisted of small circular plaques of polished metal, usually steel or silver, fixed in a shallow circular box covered with a lid, resembling in some way the 'box-mirrors' of the Etruscan and Roman. The mirror cases were chiefly made of ivory, carved with relief representations of love or domestic scenes, hunting and games, and sometimes illustrations of popular poetry and romance. Gold and silver, enamels, ebony, tortoise-shell inlaid or rich with lapis or other costly materials, were used. Indeed, the highest decorative efforts of workmanship and costly jewellery lavished on the frames, makes it seem as if the mirror was only an excuse for all this enrichment (FIGS. 7-10).

Little hand-mirrors were indispensable adjuncts to the toilets of both sexes during the sixteenth and seventeenth centuries, and were worn publicly by men in brooches and at their girdles; the women, moreover, had them inserted in their fans. They were mostly furnished with a short handle. In Massinger's play, 'The City Madam', written

ANTIQUITY

about 1624, these mirrors are referred to in this stage direction :—
'Enter Lady Frugal, Anne, Mary and Millicent in several affected postures with looking glasses at their girdles'. The mirrors, in an embossed frame, were often about four inches high and two wide.

Outside Europe mirrors were also produced during the Middle Ages. Specimens of Persian looking-glasses have been found at Tabriz, Ispahan, and other places. From Ibn Battah, 1332, we know that glass was made in Irak, the mirrors therefore probably being of genuine Persian manufacture. Of China, too, a Portuguese traveller writes, about 1560, 'the house was built with a loft and very fair . . . and all of it was a mirror'.

Thevenot, about 1660, says that the Mongolian women 'are so fond of seeing themselves that they wear a bit of looking-glass an inch in diameter, set in their rings instead of precious stone'. So it will be seen that the use and demand for mirrors was general at the close of the Middle Ages.

The year 1500, being the turning point between the Middle Ages and modern times, is also a landmark in the history of mirrors. It sees the creation of the modern looking-glass. What is it that distinguishes this 'modern' mirror from its predecessors? A modern mirror, in contrast to a mirror of ancient times, or of the Middle Ages, is a mirror of good quality, which can be built in any size or dimension desired. This could not be achieved by using large metal sheets, as such mirrors would easily bend and distort the images. It could only be done by employing large plates of glass and making them highly reflective by foliating with metal. Therefore two conditions have to be met : large plain glass sheets must have been available as well as a suitable method of applying the metal-coating. The art of producing glass plates of sufficient size had already been developed, though further and perhaps more striking progress was made during the sixteenth and seventeenth centuries.

Our attention is therefore focused on the method of applying the reflecting metal backing. The new method, resulting in the 'modern' looking-glass, is the Tin-Amalgam Process. This process can be applied to practically any size of glass. It dominated the manufacture of mirrors for nearly 400 years, and many a mirror, still hanging on our walls, was made by this method. It is not known exactly when or by whom this process was invented, but we do, however, know the following :—

MIRRORS

In 1503 two inhabitants of Murano, the brothers Andrea and Domenico del Gallo, were authorized by the Venetian council to make mirrors with a Flemish firm in Flanders, which was the only glass-house possessing the secret of making large-size mirrors of glass. The two brothers obtained in 1507 the exclusive privilege of manufacturing mirrors in Murano, Venice, for a period of twenty years. They were made by the tin-amalgam process, for Johannes Porter of Naples exactly describes the method after his visit to Venice about 1550. As in 1503 the Flemish firm was already in existence, and was the only glass-house using this process, the assumption that the invention of the tin-amalgam process dated from then can hardly be far out.

The tin-amalgam process, often incorrectly called the mercury process, simply consists in laying a thin and even tin-foil on to glass by means of mercury as a cementing medium. After the superfluous quicksilver has been squeezed away, the remaining metal film is composed of about 80 per cent. tin and 20 per cent. mercury. The main difference between the process hitherto employed, and the new method, was that cold metal and not hot or molten materials, was applied to the glass, thereby avoiding all the difficulties which were connected with the old method. Further, any size or shape of glass could be treated as the necessary tin-foils were easily provided, however large the glass might be. The application being simple, the process seemed to be ideal.

Venice made good use of the new method introduced by the brothers Gallo and developed the art of making looking-glasses on a commercial scale. The Republic enjoyed a much-prized monopoly for about a century and a half. As early as 1564 the mirror-makers of Venice formed themselves into a corporation with peculiar and exceptional privileges. The glass for the mirror was made in the same way as sheet glass before the invention of drawn sheet. Blown cylinders of glass were slit, flattened on a stone, carefully polished by 'ironing', and afterwards frequently bevelled. The glass was remarkably pure and uniform, and the sheets sometimes of considerable dimensions. As the silvering was beautifully bright, the products of the Venice-Murano glass-houses were welcomed everywhere, and a large and lucrative trade sprang up.

For example, three Venetian mirrors of crystal are mentioned in the French royal accounts of 1528, and another in the inventory of the château de Nevers, 1566. In 1597, in the marriage contract of Françoise de Schomberg a mirror of Venice glass is described, and in the inventory of Gabrielle d'Estrées (1599), among other richly decorated mirrors,

ANTIQUITY

occurs one of Venetian glass enriched with coloured enamel and set in a coloured wood frame (FIG. 6). So impressive and valuable were mirrors that Magellan, as his companion Pigafetta tells us, took looking glasses with them on their voyage round the world between 1519 and 1522. A small mirror of glass was presented as a rarity by the Venetian Republic to Marie de Medici in 1600.

How precious the Venetian mirrors were can be gauged from the inventory of the effects of M. Jean-Baptiste Colbert, minister of Louis XIV, made on the minister's death in 1683. A Venetian mirror, 46 by 26 inches, in a silver frame, is valued at 8016 livres, whereas a picture by Raphael is put down at 3000 livres ! It is therefore only natural that the Venetians guarded with the utmost jealousy the secret of their manufacture. By their statutes any glass-maker, carrying his art into a foreign state, was ordered to return on the pain of imprisonment of his nearest relatives. Should he disagree, the emissaries were delegated to slay him.

The Sources of Geoffrey of Monmouth

I. The 'Pre-Roman' King-List

by STUART PIGGOTT

THE study of Geoffrey's book and of the allied Welsh texts is a subject of such complexity, and has produced such a mass of technical literature, that the intrusion of a newcomer into these jealously guarded preserves of recondite scholarship is naturally liable to direct at once the cold stare of disapproval, or at best the wan smile of tolerance upon one so rash. I am not unmindful that in a previous world-conflict Sir (Emeritus Professor) Flinders Petrie put forward views on the *Historia*¹ from an outsider's standpoint which were instantly demolished in a few quietly incisive notes by Professor R. W. Chambers.² But, despite the vast tangle of adherent commentary which now envelops Geoffrey's book to an extent that all too often dwarfs the actual text, it seems likely that certain basic questions—is it a work of fiction or of fact, or if both, in what proportions—should be answerable to some extent by enquiring whether certain passages read convincingly as sheer invention, and if not, what prevented the author from making them so. I hope to show that one can trace in the *Historia* a use of certain documentary sources which to the best of my knowledge have not been recognized in full before. I venture therefore to put forward these tentative ideas in the hope that they may be followed up or refuted by those more qualified for the task than myself, examining the problem for the first time and from the outside, and in those enforced circumstances in which the only really accessible works of reference are the *King's Regulations* and the *Manual of Military Law*. As a contrast it is a pleasure to record my thanks to those who have aided me, notably Professor Ifor Williams, who has given me invaluable advice and helped to eradicate the more egregious errors from my argument.

Among the names of the witnesses to the foundation charter (1129) of Osney Abbey (now among the more depressing outskirts of

¹ *Proc. Brit. Academy*, 1917-18, pp. 251-78.

² *History*, 1919-20, N.S. III, 225-28; IV, 34-45.

ANTIQUITY

Oxford) appear Walter the Archdeacon, heading the list, and one Geoffrey Arthur. (*Testibus Waltero Archidiacono . . . Gaufrido Arturo. . .*)³ A few years later the second of these produced a work on early British history, in which his indebtedness to his friend the learned archdeacon was abundantly acknowledged and which, if any work is to be given the title, deserves the name of a medieval best-seller. The *Historia Regum Britanniae*, which from the evidence of the dedications appears to have been most probably written in the spring of 1136,⁴ was immensely and instantaneously popular. Despite the enormous destruction of medieval manuscripts at and since the Dissolution, nearly two hundred of the *Historia* are now extant, of which a fourth date from within two generations of its first appearance, and the influence, direct and indirect, which it has had upon English literature and popular thought up to the present day is probably unequalled among medieval writings.

The popularity of the *Historia* lay primarily in its novelty. It presented, as we should now put it, early British history from a new angle, giving an account, avowedly from the Celtic standpoint, which made the Dark Ages anything but dark, and displayed endless vistas of pre-Roman kings each with an uncouth name and a wealth of biographical anecdote, while dominating the whole of the latter part of the book the gorgeous, fabulous figure of Arthur, champion of the British, held the scene. All this obviously made for popularity, and there may be more of professional jealousy than critical faculty to be detected in William of Newburgh's remarks on his successful rival in the field of British history, whose name Arthur he unfairly suggests is a nickname ridiculing his obsession with a magnificent but entirely fictitious hero passed off as solemn fact.⁵ For it was as a considered contribution to historical literature that the *Historia* appeared, and any doubts that might arise in the reader's mind were to be set at rest by Geoffrey's disclaimer to be anything more than the translator of an ancient book in the British tongue, brought from Brittany by Walter the archdeacon.

Such was the book that Geoffrey, 'of Monmouth' as he styles himself in the preface, brought before the learned world of Stephen's reign. Manuscript copies continue into the 16th century, three printed editions appeared in the same century but none after until that of Giles

³ *Trans. Hon. Soc. Cymmrodorion* 1898-99, p. 56.

⁴ I follow Griscom's dating as set out in the Introduction to his edition of the *Historia* (1929).

⁵ *Hist. Rerum. Angl.*, Proem.

THE SOURCES OF GEOFFREY OF MONMOUTH

in 1844. By this time too the popular feeling for romantic literature had brought into print some of the early Welsh poems and certain chronicles or Bruts, including one closely allied to the *Historia* itself. Critical textual scholarship was in the 19th century being turned to medieval texts as well as classical authors, and Geoffrey's claims to be no more than the translator of an ancient Celtic chronicle were shown to be based on the most insecure foundation. By the end of the century the onslaughts of the critics had left Geoffrey with the reputation of a completely fraudulent romancer, and relegated his chronicle to the same unenviable category of forgeries as that of Richard of Cirencester, fabricated by Charles Bertram in the 18th century, dismissing it as a framework of disjointed scraps plundered from previous historians and liberally covered with fabulous stories, some of which might genuinely derive from Welsh folk-tradition but most owe their origin to Geoffrey's all too inventive mind.

The forgoing sketch of the decline and fall of the *Historia's* reputation prepares us for a closer view of the work itself. What in actual fact do we find in this debatable document? After the dedication to Robert of Gloucester, the story of the translation from an ancient original is told—*quendam britannici sermonis librum uetustissimum . . . codicem illum in latinum sermonem transferre curauit*⁶ (Bk. I, 1). This book, he elsewhere adds, had been brought from Brittany by Walter (*quem Gualterus oxenefordensis archidiaconus ex britannia aduexit*—Bk. XII, 20). After this comes a eulogy of Britain, followed by a long and elaborate version of the curious legend of the voyages and adventures of Brutus, descendant of Aeneas, fighting in the civil wars of the eastern Mediterranean after the fall of Troy and finally arriving to found a civilization in Britain. The main features of this story are given by Nennius, and in Geoffrey's version Brutus is made the founder of a prehistoric British dynasty, the ramifications and descent of which, with appropriate anecdotes, form the substance of three books. Following this are two books dealing with Caesar's campaigns and the Roman occupation, and then one book dealing with Vortigern and the first Saxon inroads. Here the chronicle is interrupted by the insertion of an earlier work of Geoffrey's, the *Vaticinia Merlini*, also purporting to be a translation from the Welsh, and the tale is taken up again in the famous three books dealing with Arthur, and terminated by a book

⁶ All quotations from the *Historia* are taken from Griscom's edition of MS. 1706 (12th century) in the University Library, Cambridge.

ANTIQUITY

largely consisting of accounts of Constantine, Conan, Vortipore and Mailcun elaborated from the jeremiads of Gildas. Excluding therefore the inserted *Vaticinia* the basic framework falls into six divisions :—

- I—The Brutus Story (Bk. I).
- II—The Pre-Roman Pedigrees (Bks. II–III).
- III—The Roman Invasions and Occupation (Bks. IV–V).
- IV—Vortigern and the first Saxon invasions (Bk. VI).
[*The Prophecies of Merlin* (Bk. VII)].
- V—Arthuriana (Bks. VIII–X).
- VI—The Tyrants and the Saxon Conquest (Bks. XI–XII).

Though at the outset Geoffrey claimed that the whole of his book was merely a translation into Latin of a Welsh (or Breton) original, yet he also admits that, at least in the story of Arthur and Modred, he used verbal information from Archdeacon Walter (*et a walterio oxenefordensi in multis historiis peritissimo uiro audiuit*—Bk. XI, I), and in his preface mentions what appear to be popular ballads of Arthur, whose acts still in his time, he says, *a multis populis quasi inscripta iocunde et memoriter predicarentur* (Bk. I, I), and these must be therefore regarded as contributory sources.⁷ The works of Bede and of Gildas are also mentioned in this preface, and the latter is referred to by name on five subsequent occasions in the *Historia*. Nor, apart from these specific references, is it difficult to recognize borrowings from Livy and from Virgil in section I, and the dedication ends in a Virgilian reminiscence with Geoffrey as another Tityrus. Use was almost certainly made of Jerome's version of the chronicle of Eusebius, either direct or through Nennius, and a wholesale plundering of this latter work is apparent throughout. Using, as Mommsen pointed out, a manuscript in which authorship is attributed not to Nennius but to Gildas,⁸ Geoffrey seems to have regarded the latter as the author not only of the *De Excidio*, which is certainly used in e.g. section VI, but also of the Nennian compilation. His reference to a life of St. Germanus by Gildas (Bk. VI, 13) suggests the passages in Nennius which Zimmer⁹ refers to a lost *Liber Beati Germani*, though there are other references (e.g. Bk. I, 18 ; II, 17 ; III, 5) which do not seem to relate to any text of Nennius as we have it today, nor to the *De Excidio*, yet are attributed to Gildas

⁷ With this may be compared William of Malmesbury's phrase about Arthur—*de quo Britonum nugae hodieque delirant*. (*Gest. Regum. Angl.* I, 8).

⁸ *Mon. Hist. Germ., Chronica Minora*, III, 133. Henry of Huntingdon similarly attributes Nennian material to Gildas.

⁹ *Nennius Vindictus* (1893), passim, esp. 16, 268.

THE SOURCES OF GEOFFREY OF MONMOUTH

as well. Professor Chambers showed that the passages dealing with Caesar are likely to have been derived, not direct from the Commentaries, but from Orosius through Bede. Misreadings of proper names (e.g. the Labienus of Orosius and Bede for the Laberius of Caesar) are perpetuated in the same way as Nennius produced a king Bellinus out of another Orosian corruption, and Bede is again copied verbally by Geoffrey in describing the stakes fixed in the bed of the Thames.¹⁰

So much for the more obvious Latin sources, the use of which by Geoffrey has been recognized and acknowledged by all students of the *Historia*. Stripped of these and of the obvious Galfridian embroideries, is there anything left which can be regarded in any way as indicating that the *vetustissimus liber britannici sermonis* really existed, and was not invented by Geoffrey to give authority to his scrap-book, following a practice not unfamiliar to medieval compilers of romances and of course a common device of fiction at all times?

I must at this point return to the Welsh chronicles or Bruts¹¹ mentioned above, since they have more than once been claimed as versions of Geoffrey's lost source-book. Some sixty manuscripts exist, dating from the early 13th century to the 18th century, and while it is clear that they have not as a group received the comparative study they deserve, neither Petrie's enthusiastic championing, nor Griscom's laborious arguments, persuade me that such study will reveal them as being anything but variant translations of the *Historia* into Welsh, with occasional additions from native tradition.¹² The close verbal correspondence between the *Historia* and the earlier Latin texts, and between it and the Bruts, surely show that Geoffrey's book could never be a close translation from a Welsh text *in toto*, and that the Welsh chronicles must copy the *Historia*. It is interesting to note how, from surviving manuscripts, contrasting graphs of the popularity of the Latin and Welsh texts can be plotted. On the basis of the number in each century the initial popularity of the *Historia* is seen to be sustained on a rising curve throughout the 13th into the 14th century, followed by a sudden collapse in the 15th century, although the first printed edition was not until 1508, when manuscript versions naturally cease. The

¹⁰ *History*, 1920, N.S. IV, 35. Cf. also Anscombe's note, *ibid.* 89.

¹¹ For these in general see Griscom's Introduction, ch. vii *et seq.*

¹² Prof. Henry Lewis, writing of the earliest (13th century) MS. of the Brut gives it as his view that 'to all intents and purposes it is a translation of Geoffrey's *Historia*—not a literal translation word-for-word version of course. It gives in Welsh, with insignificant additions and omissions, what Geoffrey gives in Latin' (*in litt.*, Jan. 1941).

ANTIQUITY

manuscripts of the Bruts start in the early 13th century, show a slight rise in the 14th and 15th centuries, with a marked increase in the 16th and 17th, no doubt as a result of the establishment of the Tudors on the English throne. This rise in the Brut graph at the point where that of the *Historia* descends suggests rather the growth in popularity of a translation, than the renaissance of a forgotten work, among the Welsh reading public. It is interesting to note that the Latin text of the *Historia*, not the Welsh text of the Bruts, was followed by the 14th century compiler of Jesus College manuscript 20, when he added *enweu brenhined y brytanyeit* to his fifty Welsh genealogies.¹³

The *vetustissimus liber* has become more shadowy and less convincing at each stage of this enquiry, but I now hope to show that from the least promising part of the *Historia* something can be extracted which in some measure may exculpate Geoffrey. But while on the one hand it may remove from his name the stigma of a complete liar, it does not on the other tend to increase confidence either in his use of sources, or in his understanding of a document which to a competent Welsh scholar of the 12th century could hardly have been so incomprehensible as it appears to have been to him.

Comment on the sources of the *Historia* has been mainly confined to that part avowedly concerned with the Dark Ages, with some reference to the Brutus story in section I. Section II, the pre-Roman part, has been at once the despair and the laughing-stock of the critics. To Nicholson¹⁴ it was the 'really fabulous' part of the *Historia*, and even Petrie felt it 'safe to say that all before the nineteen kings [ancestral to Catuvellaunus] is entirely romance'.¹⁵ And indeed a fabulous enough recital it is, with Bladud crashing in his gliding trials and Belinus building Billingsgate. But amid all the formless accumulation of legend and fantasy, one feature stands out clearly, and that is the enormous number of persons mentioned by name and in order of succession, whether they be the prehistoric kings or the children of Ebraucus. Sixty-seven successive rulers are enumerated up to Caesar's invasion in the time of Cassibellaunus (Catuvellaunus), while another 48 names of collateral descendants may be added to these, making a total of no less than 115 individuals whose names are recorded. There

¹³ *Y Cymmrodor*, 1887, VIII, 90.

¹⁴ E. W. B. Nicholson, *The Dynasties of Cunedag and the 'Harleian Genealogies'*, *Y Cymmrodor*, 1908, XXI, 81.

¹⁵ *loc. cit.* 260.

THE SOURCES OF GEOFFREY OF MONMOUTH

are obviously far more names than necessary : even Geoffrey's resourceful mind seems to run dry of legend at times, and bald king-lists are given here and there for twenty or so names at a stretch, yet he seems to have felt compelled to write down every name, however meaningless and tedious to the reader. There is nothing here of artistic selection of personage and incident to enhance the narrative, as in the *Arthuriana* of section v ; the effect is as of someone trying half-heartedly to write imaginary biographical notes in the margin of a page torn from a telephone directory, and makes equally dull reading. But in the curious insistence on names, and still more names, in this section of the *Historia* I believe a clue may exist as to the nature of one at least of Geoffrey's source-books.

The names given to these pre-Roman kings by Geoffrey, except for a few semi-classical titles at the beginning of the series, are in varying forms of Welsh, sometimes thinly latinized, and it has naturally not escaped notice that the majority of them are the names of members of British ruling families of the 6th century and later, which are preserved in medieval Welsh genealogies and king-lists, and even in some instances make their appearance again in more or less their correct context in the latter part of Geoffrey's own book. In discussing one of the extant collections of early Welsh genealogies Nicholson claimed that the names of Geoffrey's prehistoric kings were 'borrowed from *some* MS. of our "genealogies" ' ¹⁶ and it is true that a large number of the names in this section of the *Historia* are found in the collection in question. Historical characters such as Cunedda appear in a prehistoric setting, and their presence does at first sight suggest the haphazard plundering visualized by Nicholson, with Geoffrey, anxious to give 'artistic verisimilitude' to a handful of legends, picking out a few fine barbaric sounding but indisputably Welsh names such as Gurgint Barbruc or Rud Hud Hudibras from some genealogical writing to which he could attach his odds and ends of myth and invention. But such a procedure can only imply a sequence of construction of section II of the *Historia* in which the legends came first, later to be attached to the names of early medieval personages. But this in no way accounts for the superfluous names without legends at all, implying a sequence which is exactly the reverse.

Nor (and this is I think still more significant) does such a sequence account for the repetitions of identical names which in fact occur at irregular intervals through section II. Sisillius appears four times, Eldad

¹⁶ loc. cit. 86.

ANTIQUITY

three, Kimarcus or Kimarius, Coel, Moruid, Gorbonian, Cloten and many others twice. And more than repetitions of individual names, recurrence of similar groups of names, always in the same relative, if not absolute, sequence. Compare for instance the three following:—

	Cloten (Bk. II, 17)	Clotenus
	Dunuallo molmutius (Bk. II, 17)	Gurgintius
Gurgustius	Gurguit barbtruc (III, 11)	Merianus
Sisillius	Sisillius (III, 13)	Bledudo
Kimarcus	Kynarius (III, 14)	Cap
		Oenus
		Sisillius
		(Bk. III, 19)

(Bk. II, 16)

Other fixed positions can be detected too: Beli at the beginning, Ferreux and Porrex and Coel at the end of large groups usually separated lamely by Geoffrey by periods of civil wars or the like (e.g. *exinde civilis discordia multo tempore populum affixit* at the close of II, 16). These repetitions point surely in one direction—that Geoffrey was not merely choosing names at random from early Welsh pedigrees, but that the framework of section II of the *Historia* was determined by a set of name-sequences in the form of genealogies of varying lengths, which he either misunderstood to the extent of believing them to represent in truth a continuous sequence or deliberately joined them up to suit the plan of his book.

Now fortunately there exist a number of Welsh 'genealogies' going back to the 6th century and even beyond, against which we can test the supposition that we have, embedded in the legendary matter of section II, an unrecorded group of such pedigrees and king-lists. It should be said at the outset that the Galfridian name-sequences appear to be paralleled to a very limited extent in the main group of genealogies that survive and, *pace* Nicholson, it does not seem likely that Geoffrey used, in this part of the *Historia*, any version of the famous genealogies of the North British ruling families which, dating from the late 10th century, are appended to the *Annales Cambriae*, and a text of Nennius, in the early 12th century manuscript known as Harleian 3859,¹⁷ but these, and the later (14th century) versions in Jesus College, MS no. 20,¹⁸ do give us valuable information relating to the actual physical appearance of an early Welsh medieval genealogical compilation, and in so doing help materially to explain certain difficulties in the text of the *Historia*.

¹⁷ Published in *Y Cymmrodor*, 1888, IX, 141–83.

¹⁸ *Ibid.*, 1887, VIII, 83–92.

THE SOURCES OF GEOFFREY OF MONMOUTH

The 'genealogies', particularly the more ancient ones, may equally well be lines of descent within a ruling family or merely king-lists, and as they frequently show the claims to descent of numerous families from a common ancestor, several variant versions of a basic line with a group of names in common may exist. In length, they vary from four up to some thirty names, and they run backwards, the names being linked by *map*=son of, so that the eventual ancestor is at the end of the sequence. In Harl. 3859 the names run in vertical columns, thus :—

Ouen map iguel
map catell
map Rotri
map mermin

but in Jesus College MS 20 the names are run across the page as follows :—

Rodri m Meruyn m Ethellt Merch Cynan tintaethwy m Rodri molwynauc

It is obvious that in such a manuscript as the second, genealogies might easily be run into one another, or divisions made in the wrong place, and without knowledge of the exact families represented it would be almost impossible to disentangle from the *Historia* the individual genealogies. But it is important to note that certain correspondences can be made between the name-sequences in section II and extant medieval Welsh pedigrees, and certain main groups can be detected which probably correspond to original divisions in the manuscript copied.

The founders of the British dynasties in the *Historia* are of course Brutus and his queen Ignoge, and his immediate ancestors are obvious eponyms of the regions of Britain invented by Geoffrey—e.g. Kamber for Cambria and Habren for Sabrina—and the ninth in descent is Ebraucus, presumably a Yorkshireman. He is credited with twenty sons and thirty daughters, whose names, given in Book II, 8, form the first of Geoffrey's meaningless lists. Since the first son is Brutus, and the first two daughters are Gloigin and Ignogin (clearly doublets) it is safe to assume that these names actually constitute another set of pedigrees, in the male and female lines, which traced themselves back to Brutus and which Geoffrey, for want of a better invention, fathered on a philoprogenitive Ebraucus. Such descent from a wholly or partly mythical race-founder is of course common in primitive genealogies, as witness the Saxon kings' descent from Woden; and it is interesting to note that, while I have not come across other Welsh descents traced

ANTIQUITY

back to Brutus (though such may of course exist) in the early 13th century *De Situ Brecheniauc* St. Kynauc of Merthyr Cynog takes his ancestry back to Annhun the Black, king of the Greeks.¹⁹ Among the names in the Children of Ebraucus list is Margadud. An individual of this name occurs in Bk. XI, 13 as *rex demetarum*, fighting with Brocmail at Bangor in the early 7th century and a *maredud* in JC xxxi²⁰ appears as a grandson of Howel Dda with Regin next but one. This suggests the *Regin map morgetiud* of HG XIII.²⁰ Sisillius appears separated by one name from Moruid; he is Moruid's grandfather in Bk. III, 14-15. *Kincar* occurs further down the list and is a common Welsh name, occurring in e.g. HG II and X, and later still Eldad, the descendant of Sisillius and of Moruid in Bk. III, xxx, 14-15, and Kerin, who as Cherin is another member of the same sequence in this place. Among the 'daughters' is Tangustel; a Tangustela marries Danius, son of Sisillius, in Bk. III, 14, and *Tancoyslt* appears in HG II. Tangwystl, Professor Ifor Williams again informs me, is a name of very frequent occurrence in Welsh.

After this list follows a short succession (Bk. II, 9-14) from Leil to Marganus, dominated by the Leir story. None of the names of this dynasty (ten in all) occur elsewhere in the *Historia*, nor, so far as I have been able to trace, in the Welsh pedigrees I have examined, and I am inclined to regard the Leir episode as a complete legend inserted *en bloc*, names and all, in the same way as the Welsh Bruts interpolate the story of Lludd and Llefelys into the *Historia* text at a later stage. With the appearance of Cunedagius (Cunedda) however in Bk. II, 15, we seem to return to historical characters, and as grandson to him appears Gurgustius (the *Gurgust* of HG VIII) followed by Sisillius and Kimarcus and ending with Ferreux and Porrex. To this sequence one may compare the *Kynvarch m meirchawn m gwrgust letlwm* of JC V, xvii and xxxiv; *Gorust ledlwm* is among the 'Men of the North' in *Boned Gwyr y Gogledd* in Hengwrt 536 (early 13th century).²¹ There is resemblance to the list in the Children of Ebraucus, but much more markedly to the sequences in Bk. III, 11 and 19, as already quoted. Ferreux and Porrex are a pair of those unconvincing twin names of the Hengist and Horsa type, but Porrex turns up again towards the end of a long series of names including the 'Sisillius group' in Bk. III, 19.

¹⁹ Published in *Y Cymmrodor*, 1906, xix, 18-50.

²⁰ References to the genealogies in Harl. 3859 and Jesus College MS. 20 are given as 'HG' and 'JC' respectively, followed by the number of the pedigree.

²¹ Published by Skene, *Four Ancient Books of Wales*, 1868, II, 455.

THE SOURCES OF GEOFFREY OF MONMOUTH

A 'bridge passage' of civil wars links us to the establishment of a new dynasty under Cloten in Bk. II, 17, who appears again in Bk. III, 19 and in HG II. He is followed by Dunuallo molmutius and his son Brennius (this is clearly the *Bran hen map dumngual moilmut* of HG X) and Beli. Now king Beli or Belinus suffers from the suspicion that he may sometimes represent nothing more tangible than a misreading in Nennius of a corrupt phrase in Orosius, but Nicholson, and following him Graves,²² have suggested that in some instances the Beli of the Welsh genealogies (e.g. HG I, v) may be an eponymous Belgic god-ancestor. He may therefore here mark the beginning of a new pedigree, which is continued with Gurgint barbtruc, Guithelinus, Sisillius, Kimarius, his brother Danius who marries Tangustela, and Moruid. This sequence will by now be familiar to the reader; I am inclined to think that Gurgustius and Gurgint (Gurgintus in Bk. III, 19), are probably interchangeable. The list of British kings copied from the *Historia* at the end of Jesus College manuscript 20 certainly gives *Gwrgan varyftrwch* for the Gurgustius of Bk. II, 15 and a *Gwrnet vrich hir* in Bk. III, 11.

After Moruid we plunge into a mass of names. His sons include Gorbonianus (*Garbaniaun* in HG X), Arthgallo and Peredur, whose son is Runo. Now HG V gives *Run map arthgal*, and *Peretur* appears in HG XII, so some relationship of Run to the two brothers seems established. The appearance of a Gohrbonianus as a nephew of Run by Elidurus suggests the opening of another pedigree of his descendants, which go through Catellus (*Catell* in HG I, XVI), Cherin and Eldaldus, who should be compared with the Kerin and Eldad of Bk. II, 8.

By now Geoffrey is running dry of anecdote. The succession of kings is baldly stated, with the shortest comments, and among the names come Porrex again, Urianus (perhaps the *Urbgen* of Nennius and of HG VIII) and Coillus, the *Coil hen* of HG VIII and many other pedigrees. In the end, the names are given entirely without comment—*cui eliud, cui cledaucus, cui clotenus* . . .—another example of the 'names at all costs' principle that seems to have counted for so much in Geoffrey's mind in this part of the book. As a successor to Cledaucus the inevitable Sisillius appears, at six removes; he is the son of Cledauc—*seissil map clitauc* in HG XXVI. Before him and after Cloten come Gurgintus and Merianus, suggesting the *merchiawn map gwrgust* of JC XVII; Bledudo is presumably the Bladud of Bk. II, 10, and Sisillius

²² *Trans. St. Albans & Herts. Arch. Soc.*, 1934, p. 161.

ANTIQUITY

as a descendant of Gurgintus is of course in agreement with the sequences noted already, as is Eldol (Eldaldus ?) as one of the successors of Sisillius. Among the other names in this part of the list one may note Archmail (*Arthmail* in HG XXIX), Redechius, presumably the *Riderch* of HG V, and Samuil Penissel (HG XIX) who appears as two separate individuals !

We now come to the eve of Caesar's invasion, and a new dynasty begins with Heli, who may be Beli again, followed by Cassibellaunus, Tenuantius and Kimbelinus. Now this succession is of considerable archaeological interest. Modern research, based largely on the evidence of the coins of the Belgic rulers, has shown that Tasciovanus must have been the father of Cunobelin, a fact nowhere recorded by classical writers. But Graves²³ pointed out that this relationship must have been preserved in Welsh tradition to find a place in the early medieval genealogies (e.g. HG X, XVI) where the two individuals appear in the correct sequence as ancestors of Cunedda, with Tasciovanus as *Teuhant*, evidently pronounced with a strongly aspirated or guttural 'h,' as the variant *Tecwant* in JC V shows, and philologically undoubtedly to be derived from the same British root as Tasciovanus. In the *Historia* this relationship is preserved, with *Tenuantius* an obvious enough scribal error for *Tehuantius*, and Guiderus the son of Cunobelinus is the *Guidgen* who is his grandson in HG XVI. At the end of this small group (which includes an Arviragus presumably inserted from Juvenal) comes Coilus, and one may note Nennius, brother of Cassibellaunus, the *Nynnyaw* of JC IX.²⁴

We have now threaded our way through the maze of Geoffrey's prehistory, with the genealogies as our clue. What have we gathered from this laborious examination and comparison ? I do not think one can reasonably escape from the conclusion that as one of the main sources for section II of the *Historia* he used a collection of genealogies of the type of, but not identical with, that in Harl. 3859, and one in which the family of Seissill played an important part, and that he did not merely pick out names at random, but actually took the pedigrees as they stood as the framework for the entire section. If there was a *vetustissimus liber* at all, these genealogies seem likely to have formed an

²³ loc. cit. 159-65.

²⁴ On the name 'Nennius' in early Welsh documents see Zimmer, *Nen. Vind.* 130-1.

THE SOURCES OF GEOFFREY OF MONMOUTH

important part of it. The precious book, of which the noteworthy feature stressed by Geoffrey was that it recorded, not the exploits of Arthur or the story of Brutus, but the names and deeds of the kings of Britain successively and in order (*actus omnium continue et ex ordine*) seems likely to have been a manuscript of genealogies of some group of ruling families of the Welsh Dark Ages. But one pedigree, the last in the manuscript before him, included the names of Cassibellaunus and Cimbelinus—names familiar to Geoffrey from the classical sources which formed his authorities for the section dealing with Caesar's invasions. Was it this that made Geoffrey relegate the preceding lists of names, meaningless to him, to the pre-Roman era, and was he further influenced in this by the first two pedigrees of his source-book beginning with Brutus? In the retention of the meaningless lists of names without comment we may indeed see the vestige, perhaps the only vestige, of an historical conscience which prevented him from discarding large portions of his source-book for want of interesting anecdote to adorn them.

Considered as a work of pure fiction, section II of the *Historia* fails to convince. Behind the legends and the fantasies which might by themselves be plausibly connected into an agreeable fiction there are constant evidences of something extraneous asserting its existence, something which prevented the author from making a successful composition, something which had a restraining influence upon even Geoffrey's exuberant imagination. Incompletely appreciating their content and their significance, but with a vague feeling that they must at all costs be embodied in his narrative, Geoffrey made the best he could of the impossible material of the genealogies, but his best could not conceal the inevitable indigestibility of his source.

If this was the case, one or two interesting points arise. In the first place Geoffrey must have translated and transposed the pedigrees into the sequence in which they now occur in the Latin text of the *Historia*, and the same would apply to the genealogical information put into the mouth of Cadwallon in Bk. XII, 6. There is however a most curious fragment of an untranslated group of pedigrees embedded intact in the Latin text of Bk. IX, 12, where Geoffrey gives as it were an extract from the Court and Society Column, and lists the guests at Arthur's coronation at Caerleon. An improbable group of dignitaries, with their titles, are given first, and then *uenerunt non minoris dignitatis heroes* in the following remarkable list—

ANTIQUITY

*Donaut. Mappapo. Cheneus. Mapcoil. Peredur. Maperidur. Grifud.
Mapnogord. Regin. Mapclaut. Eddeliui. Mapoledauc. Kyncar Mabbangan.
Kynmaroc. Gorbonian. Masgoit. Worloit. Runmapneton. Kymbelin. Edelnauth.
Maptrunat. Cathleus. Mapkathel. Kynlit. Maptieton.*²⁵

It is immediately apparent that every alternate name begins with *map*, and one has only to replace the same preposition before the others to find the list of 'guests' opening with the well-known table of descent of Dunaut from Coel—the *Dunaut map pappo map Ceneu map Coylhen* of HG XI and of *Boned Gwyr y Gogledd* IV. The occurrence of many names used in section II is to be noted: *Runmapneton* is resolved into the *Run map neithon* of HG XVI, and the end of the list suggests the *map catleu map catel map decion map cinis scaplaut* of the same pedigree. But why has Geoffrey left this rough fragment in an almost unworked state, and why have only half the *map*-prefixes been struck out? It is I think possible that the prefixes may have been lost owing to the manuscript copied by Geoffrey having been written as follows—

Dunaut map pappo
[*map*] *Cheneus map coil*
[*map*] *Peredur map peridur*

in such a way that damage to the left-hand margin might remove the alternate prepositions. But we are still left with the puzzle as to why Geoffrey relied on his public swallowing this incompletely doctored genealogical oddment as a genuine list of guests, and it may even suggest that, as the curious treatment of the other genealogical material to form the pre-Roman king-lists hints, he was not so conversant with his British sources as he would have his readers believe, and but imperfectly understood the manuscripts from which he worked.

Whatever the origin of the name-sequences in section II of the *Historia*, this forgoing example leaves no doubt as to its derivation from a group of Dark Age pedigrees closely allied to those in Harleian 3859. It is to this manuscript that I would again direct attention now that we come to the main crux—what was the precise nature of Geoffrey's genealogical source-book and how it may relate to his *vetustissimus liber*? It is of early 12th century date, and the contents are as follows—

²⁵ I am indebted to Professor Henry Lewis for the information that the Welsh Bruts give this list with progressively increased omissions according to the date of the manuscript. Dingestow Court MS. (early 13th century) gives it complete. Shortened versions appear in the Red Book of Hergest (c. 1380) and Hafod 1 (first half of 14th century), where only six names remain, while Jesus College MS. LXI (15th century) omits it entirely.

THE SOURCES OF GEOFFREY OF MONMOUTH

- (a) Notes on world chronology (*De Sex Aetatibus Mundi*).
- (b) The compilation known as *Historia Britonum*.
- (c) Saxon genealogies.
- (d) More from the same source as (a)
- (e) Chronological notes on Welsh history (*Annales Cambriae*).
- (f) Welsh genealogies.
- (g) The twenty-eight cities of Britain.
- (h) The marvels of Britain.

Of these, all but (e) and (f) form the historical compilation known under the general title of the *Historia Britonum* of Nennius which exists in many other manuscripts from the 10th century onwards. Nicholson has shown that there is reason for believing Harl. 3859 to have been made for the cathedral church of St. Davids,²⁶ and it clearly represents a compendium of all that was available to the compilers on the subject of Welsh history—a few chronological notes from classical sources, detached incidents of legend or fact from the Celtic past, annals in the form of marginal notes on a Paschal cycle, and catalogues of towns, battles, wonders and persons. Such catalogues form the staple of the early attempts at history and literature—the Welsh Triads are a very formalized type; the Homeric Catalogue of Ships is a famous example, and the moment Widsith ‘unlocks his word-hoard’ a formidable list of nobility and gentry come tumbling out.

The main basis of the whole of Geoffrey’s book was some version of the Nennian compilation. Zimmer,²⁷ stressing his connexions with Monmouth and Llandaff (where his uncle, Uchtryd, was bishop), was of the opinion that he must have used the south Welsh recension of the *Volumen Britanniae* of 796. Mommsen further pointed out that his references to Gildas as the author of this compilation implies that he used a manuscript of the PQ class, in which the authorship is thus attributed²⁸ (and with some justification, since one of the main sources used by Nennius appears to have been the historical first part of the *De Excidio* with additions to 758). It is difficult to see, from the text of the *Historia*, the exact version of Nennius used, but it does seem to me that little or nothing was used from this source after a date c. 550. Section VI of the *Historia* does seem rather to be based on the second part of the *De Excidio* and on Bede rather than on anything in Nennius, and though an *ex silentio* argument is always dangerous, it is worth while suggesting as a possibility that Geoffrey used not the text as we have it today, but one of the component source-books of the Nennian compilation which ended

²⁶ *Y Cymmrodor*, 1908, XXI, 65.

²⁷ *op. cit.* 277. ²⁸ *Mon. Hist. Germ., Chronica Minora*, III, 133.

ANTIQUITY

with the *Arthuriana*, which in manuscripts M and N of Mommsen's collation ends with the words *ad hunc quem nunc scribimus annum dcxlvii numeramus*—a date which would agree with the suggestion made above.²⁹

But, together with this Nennius, Geoffrey was using a collection of pedigrees. Now early Welsh genealogies were incorporated in the *Volumen Britanniae* itself (e.g. cap. 49) and were presumably derived from some manuscript available to the compiler c. 796; is it possible that Geoffrey's source-book included this material or even was the same as that used by Nennius? Of the individuals mentioned in section II and in the Catalogue of Guests, those whose dates can be fixed by entries in the *Annales* or otherwise ascertained mostly belong to the 5th and 6th centuries (e.g. Dunaut *ob.* 595, Peridur *ob.* 580, Redechius (Riderch) c. 575–600, Cunedda c. 400).³⁰ It is worth mentioning that in the Children of Ebraucus appear personages who might be equated with a Margadud (Margetiut) who died in 796 and a Regin who died in 808, and there is a Tangustela (according to Harl. 3859) whose father, Owen, died in 811. It might be therefore necessary to assume a group of pedigrees collected not earlier than the early part of the 9th century, and in effect not so remote from those in Harl. 3859, which date from immediately *post* 954, though the evidence for so late a date is not conclusive, since Maredudd, Regin and Tangwystl are names too common to be distinctive. The pedigrees may therefore date from the late 6th century. Harl. 3859 is however of importance since it seems likely that it is the sole surviving representative of a type of historical compilation, examples of which may well have existed at each of the main centres of the medieval Welsh church. In these, with a Nennius as a nucleus, odd scraps of historical and genealogical information were added from time to time, and it is tempting to assume that Geoffrey may have taken his material from a sister manuscript to Harl. 3859, the property not of St. David's, but of Llandaff, and including a collection of pedigrees relating to a group of families or a region different from that in which the St. David's compiler was interested.

The sources of the anecdotes and stories clothing the genealogical skeleton of section II must be manifold, and await patient disentangling. Certainly Geoffrey used odd scraps of classical information, as for instance the passage about the coal fires at Bath, copied verbatim from

²⁹ A Romano-British nucleus ending in 547 has been assumed by Foord (*Last Age of Roman Britain*, 26). Even Liebermann admits some such source for the Vortigern information (*Essays in Medieval History presented to T. F. Tout*, 1925, no. 3, p. 40).

³⁰ For these dates I follow Nicholson in *Y Cymmrodor*, xxi.

THE SOURCES OF GEOFFREY OF MONMOUTH

Solinus,³¹ and attached to Bladud, while the story of Brennus sacking Rome is attributed to Brennius (Bran). But there is a hint that there may have been marginal notes relating to individuals in the genealogies he copied, even though he did not always understand them completely. One of the sillier stories in the *Historia* is that of Nennius, brother of Cassibellaunus, being killed by Julius Caesar's sword—*erat nomen gladii crocea mors quia nullus euadebat uiuus qui cum illo uulnerabatur* (Bk. IV, 4). Now this odd name for a sword may quite possibly be a muddled reference to the great pestilence of c. 545–550, the *flava pestis* which ravaged the eastern Mediterranean in Justinian's time. The plague spread to Britain by 547, when Mailcun died of the *mortalitas magna*, as the *Annales Cambriae* record under that year, and reached Ireland by 548, and the reference to one Nennius having died of *crocea mors* looks suspiciously like the incorporation and elaboration of a marginal note in Geoffrey's source-book^{31a} recording his death from the plague. (Actually it need not have been the pestilence of 547, for outbreaks of epidemics occurred in the west and north of Britain in 663–664 and 683–685, and the former is referred to in the Irish records as the *buide conaill*, where *buide*=yellow, but at all events the Nennius story in the *Historia* may preserve a genuine 6th or 7th-century note).³²

³¹ *Collect. Rerum Memorab.*, Bk. 22.

^{31a} Professor Ifor Williams, commenting on this, notes that the Welsh Bruts translate *crocea mors* by *angan glas*, and the *flava pestis* is known as *y fad felyn*, with the adjective *melyn*=yellow, whereas *glas* is used of all shades of colour from grey to purple, including blue and green. In the Gododin *glas* is used of mead, and in Mod. Welsh *angan glas* is still used for *pallida mors*, and the verb *glasu* for becoming 'blue' with cold, and so *glas* might equate with yellowish-green. On the other hand, with *angan glas* as a plausible name for a blue steel blade, he suggests a possible mistranslation by Geoffrey of *glas* into *crocea*, this presupposing the note in the original to have been in Welsh, and not in Latin as I visualize.

³² For the Celtic (mainly Irish and Scottish) sources of information on the recurrent plagues affecting Britain in the Dark Ages see Zimmer, *op. cit.* 302 ff. The death of Mailcun is not recorded by Nennius nor by Geoffrey, although the Bruts insert a note recording his death in a church (e.g. in the Dingestow Court MS.—*Ac or diwed yd aeth y myrwn eglwys ger llaw y Castell e hun yn dygannwy ac yno y bu uarw*) and Jesus College LXI further adds that he died because he saw the 'yellow spectre', which may show a folk-memory in the 15th century of the *flava pestis*. The plague was presumably borne along the western seaways from the Mediterranean by rats in the ships, and consequently affected the Highland Zone to a greater degree than the rest of Britain, though the plague of c. 685 seems to have decimated the monasteries at Jarrow (*Lives of the Abbots*, cap. 14) and Lindisfarne (Bede, *Life of St. Cuthbert*, cap. 27) and to have affected other coastal regions such as Selsey (Bede, *Eccl. Hist.* Bk IV cap. 14). I am indebted to the National Library of Wales for the reading from the Dingestow Court Brut.

ANTIQUITY

It is of course difficult to reconcile the forgoing suggestions with the explicit statements about the *vetustissimus liber* given by Geoffrey himself. Such a manuscript as I have visualized would certainly have been in Latin save for the pedigrees themselves; those in Harl. 3859 are certainly *britannici sermonis*, and if this was so with Geoffrey's genealogies he must, as we have seen, 'translated' them to a certain extent to use them in his book, although his treatment of the Catalogue of Guests suggests that the structure of an early medieval Welsh pedigree was something of a puzzle to him. I have mentioned Llandaff as a possible place of origin for a manuscript which might have supplied him with his material, but it is of course by no means impossible that a south Welsh one might have found its way to Brittany, where Walter is alleged to have discovered it. There appears to be a consensus of opinion in translating *Britannia* as Brittany, but the possibility of its representing 'Britain' as opposed to 'England' should be borne in mind. The Breton episodes attributed to Arthur by Geoffrey may in part be due to misreadings of *Armorica* for *Armonica* (= Arfon, in North Wales)³³ and partly perhaps to confusion with the 3rd-century punitive expedition of the Legio VI Victrix to Brittany under L. Artorius Castus.³⁴ At all events they can hardly be used as evidence of a Breton origin for *vetustissimus liber*. But on the whole it seems to me likely that this all too plausible a tale is an invention of Geoffrey's, based on just enough truth (the use of early documents dealing with Welsh history) to suggest its elaboration, and with the deception carried out with conscious humour, in which the fact that the genealogies did indeed contain names *continue et ex ordine* is played off against the added statement, of which the writer alone would see the incongruous humour, that these dull, bare catalogues were *perpulcris orationibus* in their literary style. I should like to think that it may have been with a certain enjoyment that he saw the Welsh deluded by his rehash of their own genealogies, and deceived in that very study which no doubt in his time, as in Earle's day, was 'an Art in England, but in Wales Nature, where they are borne with Heraldry in their mouthes, and each Name is a Pedegree'.

³³ As suggested by Meissner (*The Celtic Church after the Synod of Whitby*, 66). I cannot however agree with his arguments in favour of the use of the same ancient Celtic sources by Geoffrey and the writer of the *Life of Oswald* in 1165. The latter seems merely to have copied direct from the *Historia*.

³⁴ Foord, *op. cit.* 52.

Notes and News

MADRAS CATAMARANS

Mr Herbert M. Vaughan writes :—

I was much interested in reading Mr James Hornell's note on Madras Catamarans in the December number. Perhaps the following account of these South Indian boats, by an observant naval chaplain during the warfare between the British and French fleets in the Bay of Bengal between 1779–1782, may be of some interest. The writer was my great-grandfather, the Reverend Benjamin Millingchamp, who was then acting chaplain to Admiral Sir Edward Hughes on board his flagship, the *Superbe*.

‘ December 21st [1781]. The Boats of the Squadron were ordered to tow off the Catamarans with the Eighteen Pounders. The Catamarans are composed of three Logs of Wood lashed together, coarsely fashioned, with a small breakwater forward. Three of these properly secured bring off a Gun or Anchor for a 74 Gun Ship. It is incredible to what a distance at sea the native Fishermen will risk themselves on these uncouth Vessels with an old tattered sail and with what dexterity they manage 'em when it blows hard, one of the party always supporting the Mast, whilst the others rigg out their Paddles to windward and seat themselves on the Flat end at a good distance from the Catamaran, contriving by this means to carry a pressed Sail. On a Catamaran with a little Rice and Water these poor Men will undertake a Voyage of a week or nine days and appear to bear their fate with a great degree of Cheerfulness ’.

PRIMITIVE CULTURE IN NIGERIA AND BRITAIN

In the first decade of this century the people of Nigeria were still mostly in a prehistoric phase of civilization. The wheel was not used in any form, and there were no mills, no potter's wheel and no carts. This is the more remarkable in that for centuries pilgrims to Mecca must have seen the wheel in its various forms, and many survived the perils of the road to return. A comparison of things here with things found in England of prehistoric date may be of interest.

ANTIQUITY

One is struck by the small proportion of imperishable things in the primitive community. Mud houses thatched with grass, calabashes, baskets, skin or cloth bags and clothing, woven grass mats—all these decay quickly. Worn out iron tools are beaten up by the smith and re-used. Broken pots are broken up into smaller fragments and beaten into the mud floors. Almost the only durable relics are saddle-stone querns, perforated by prolonged use, and the circles of stones on which their granaries (*rumbus*) have been built to escape the white ant. Talking of grain storage, the people of Bornu store grain in deep pits lined with mats, and the grain pits at Woodbury looked obvious enough. Grain is usually stored in the ear to delay the ravages of pests.

The grinding of corn was—and is—done on primitive neolithic saddle-querns. In houses this is mounted about crutch high, sloping forward, so that the flour drops from the front edge on to a tray or calabash. The grain is heaped, a handful at a time, above the rubber.

HOUSE-BUILDING. In the normal round house the circle is marked out with a string from a peg. No foundations are dug. The bricks are made of brick-earth and dried grass well mixed and wetted and trodden into pug. A handful of this slapped on the hard ground produces the plano-convex brick, with the marks of the hand on the convex side. These dry in the sun as they lie. The mortar is the same mud, wet. The diameter of the usual round house varies from about 8 to 20 feet, but the maximum diameter is limited by the length of the palm-leaf ribs used as rafters. (By providing concentric bearing-surfaces at ten-foot intervals I built a sound roof 60 feet in diameter, but that was not normal). The angle of the roof is not less than 45°. The door opens inwards, and is hinged on a pivot, moving in a cupped stone at the bottom, and a similar point held in a ringbolt at the top. Floors of beaten mud are surfaced with potsherds beaten in and treated with the gummy infusion of the locust bean. I have seen a section showing eleven floors one above the other. A typical farmstead consists of a ring of half-a-dozen huts with granaries between, round a courtyard, which is entered by a gatehouse (*zauri*).

POTTERY. Pots are made with astonishing accuracy by the coil method. Spherical pots a foot in diameter, with a mouth an inch wide, are made by movement of the pot as it grows in all directions in a shallow saucer-shaped depression in a stone. After drying in the sun



1. THE HIND, GLEANN DOMHAIN, ARGYLL ($\frac{2}{7}$)



2. FISH, GORGE OF THE ESK, NEAR ROSLIN, MIDLOTHIAN ($\frac{1}{2}$)



3. STYLIZED ANIMAL, DUNADD, ARGYLL

Ph. J. S. Richardson

NOTES AND NEWS

the pots are piled in a heap, packed with dry grass. The grass is fired and the burning of the pots is done in one evening. The result is a strong cooking-pot which can stand the fire. The shapes of the pots are not unlike those of our Iron Age, but the bottoms are usually rounded. Some of the water-pots have narrow necks with everted rims, and handles. No kiln is used. The round-bottomed cooking-pot stands over the fire on three large lumps of clay, like loom-weights, which resist fire better than stones. 'Uku uku sun gamma galin', three three they finish the town, is a Haussa saying. I have found lumps of ferruginous sandstone, burnt to a wine-red colour on British sites of the Iron Age which may have been so used, but nothing to compare with the *murufu*. How did our Iron Age and Romano-British folk support their earthenware pots over the fire? In a railway cutting in Nupe several large pots were discovered, rather like large Bronze Age urns. They were inverted and entire, and contained no ashes or bones but only three iron arm-rings and a copper torc.

IRON-SMELTING. The smelting of iron results in cakes of slag like those found on British Iron Age sites, but about 18 inches in diameter. A burnt clay cylinder, about 2 feet in diameter, 2 inches thick and 4 feet high, with holes at the bottom, is filled with alternate layers of charcoal and ore. This is lighted up and kept going with bellows. When burnt through, more wood is thrown in at the top for a couple of days. The result is a puddle of impure iron and slag. The smith's anvil is like an enormous nail with a big head. His hammer is pear-shaped, the handle merely a lengthening of the thin end. The bellows are a pair of bags worked one by each hand, blowing through a clay nozzle. The axe used for tree-felling and rough shaping is of exactly the same shape as a celt, and is hafted in the same way. The adze, which forms almost the sole tool of the carpenter, is socketed, and set on a short hair-pin-bent handle.

The dug-out canoe is hollowed out largely by the use of fire. The charred wood is easily removed. Large trading canoes have the sides raised by boards, attached by scores of cleats of thin iron 3 to 5 inches long. *Kapok* is used to calk the seams.

There are many interesting industries in the Northern Provinces, but some are hardly relevant to our primitive comparisons. For instance, the Bida bead makers are famous. They grind, polish and drill cornelians, and produce necklaces exactly like those in the Egyptian rooms of the British Museum. I have seen them at work. The grinding and polishing is done by rubbing to-and-fro on large wet slabs of

ANTIQUITY

some special stone brought from Jebba. The drilling is done by tapping on a small drill, and it takes a day to perforate one bead.

At a village in Kontagora is a bed of soft shale which hardens on exposure to the air. Out of this shale the people cut arm-rings. The excision of the middle of the ring by a circle of x-shaped cuts produces a disc like the 'coal money' of the Purbeck hills. The use of lumps of quartz for roughening the surface of saddle-stones by hammering, results in the piece of quartz becoming round as a tennis ball and about that size. It then loses efficiency for chipping and is put aside as a missile.

H. S. W. EDWARDES.

ROCK ENGRAVINGS IN SCOTLAND (PLATE, p. 288)

The 'hind' reproduced in FIG. 1 is carved on a quite inconspicuous flat rock surface in Gleann Domhain, the wild ravine through which the Barbreck river flows down towards Loch Craignish, Argyll. Between the crags and the river on its northwest bank is a marshy terrace traversed by the footpath leading to the deserted croft of Lagolochan and Loch Avich. It is covered with moss and grass which can be seen encroaching on the flat carved surface in the photograph, so that the spot is extremely hard to find. I was informed of the carving by my colleague Dr Arthur Geddes, but should never have found it but for the guidance of Mr MacLulich, the former game-keeper at Barbreck House who also showed the hind to Dr Geddes.

Technically its sharply cut outlines at once differentiate the hind from the coarsely 'pocked' Bronze Age carvings so common in the county. Moreover the carving must be classed as naturalistic. The immediacy of the representation distinguishes it from more sophisticated works such as the famous boar at Dunadd; for the latter, though very lively, betrays the conscious stylization characteristic of the so-called Pictish symbol-stones. The Barbreck hind is in fact treated with the same directness as characterizes the art of Stone Age hunters, and in particular the 'Arctic' rock pictures of Norway and northern Sweden. Mr M. C. Burkitt confirms its similarity to the earlier Scandinavian group. It would be tempting to see in our hind a hint of the former presence in Scotland of hunters sharing artistic traditions with the Scandinavian artists of the later Stone Age. The 'elk' published by Mr Edwards from a cave at Wemyss, Fife (*Proc. Soc. Ant. Scot* (1932-3) LXVII, 173) provides a possible comparison, nearer in space if more remote technically and stylistically.

NOTES AND NEWS

The fish illustrated in FIG. 2 may also rank as naturalistic. It is engraved on the flat top of a projecting crag close beside the footpath from Roslin to Polton in the narrow gorge of the South Esk (Midlothian) some 20 feet above the river bed. The rocky promontory is nearly opposite the shallow rock shelter in the grounds of Hawthornden House, where Mr Taylor discovered a series of geometrical rock-scribings that were described in *Proc. Soc. Ant. Scot.* (1939-40), LXXIII, 316-8. The fish, however, is as different from these technically, as in subject matter; for the Hawthornden figures are mostly quite coarsely pocked. They are moreover situated on a relatively inaccessible ledge with sheer precipices above and below. The fish on the contrary lies close to a public path where the valley walls are more gently stepped. That is why the rock on which it is carved is disfigured by so many recent initials. The patina of the fish's outlines is, however, quite different from that of the initials and is indistinguishable from that of the rest of the rock. Otherwise there is no indication of the carving's age. Of course the gorge, still beautifully wooded, must always have been very difficult to traverse even on the less precipitous west bank.

The stylized animal shown in FIG. 3 is from a photograph kindly supplied by Mr J. S. Richardson, Inspector of Ancient Monuments for Scotland, and takes us back to Argyll, to Dunadd. It was discovered in the summer of 1929 by Mr Craw junior on a lichen-covered rock face that has been partially cleaned to expose the carving. This is situated on the precipitous face of the step of rock that rises vertically from the plateau fort or outer bailey to the ridge fort or citadel to the northwest. The particular ledge in question separates what were designated 'fort E' and 'fort C' in Dr Ross's plan published in *Proc. Soc. Ant. Scot.*, xxxix, fig. 20, p. 296 (reproduced, *ibid.*, LXIV, p. 114). It is thus a step up to the ridge on the top of which, further to the southwest (in 'fort B'), are carved the famous boar and the foot-mark. The animal is certainly stylized, so that its species cannot be determined with any confidence. Judged by the mannerisms of its treatment it might well be classed in the 'Pictish' group though it does not recur among the recognized symbols.

V. G. CHILDE.

Reviews

EXCAVATIONS AT HARAPPA : being an account of Archaeological Excavations carried out at Harappa between the years 1920-1 and 1933-4. By MADHU SARUP VATS. *Delhi* (Manager of Publications), 1940. pp. xv, 488, and 139 plates. £3 17s.

Historically Harappa was the first site of the Indus civilization to be known to science. The mounds were noted by Masson as early as 1822 and were studied by Cunningham in 1853. Seals from the ruins were published in 1875 and excavations were begun by Rai Bahadur Daya Ram Sahni in January 1921. (The 'prehistoric' remains at the more famous site of Mohenjo-daro in Sindh were first recognized below Buddhist ruins in 1922). From 1926 to 1934 the work was taken over by Mr Vats, on whom has fallen the arduous task of publishing the results, here admirably fulfilled. It should be insisted at the outset that the conditions of excavation at Harappa were far less favourable than at the now classic site in Sindh. The living and laboratory accommodation provided is far less commodious (I know this to my cost). The ruins have been far more grievously despoiled. Bricks, carted from the mounds with the aid of a light railway, provided ballast for a hundred miles of the Mooltan-Lahore railway. They have also provided materials for the construction of the modern village of five thousand souls that shelters among the mounds.

Owing largely to this vandalism most of the ancient buildings have been wrecked and the stratigraphy has been seriously disturbed, so that the indications of depths, carefully given in every instance, are significant in determining the relative age only of classes of objects numerous enough to be treated statistically. So not even Mr Vats' very precise observations suffice in themselves to settle the controversy provoked by that famous sandstone statuette (first published by Marshall and republished here), whose excellence is unparalleled till Hellenistic times. The comparatively frequent use of sun-dried bricks in combination with kiln-fired bricks, such as preponderate at Mohenjo-daro, has further militated against the survival of buildings. Accordingly the mounds of Harappa have not yet yielded the houses and shops with well-preserved stairs and fittings such as bring back so vividly the life of Mohenjo-daro four and a half millennia ago.

The largest structure exposed, a block 168 feet long by 135 feet wide, is plausibly explained as a granary. Like the inscriptions of Sumerian kings recording the erection of granaries, it emphasizes the importance of accumulated supplies of corn for such great urban agglomerations. Not very far away the

REVIEWS

excavator exposed an interesting group of fourteen houses, all built of mud brick on a monotonously uniform plan like the cottages run up by nineteenth century mining companies and factory owners for their employees. They seem indeed to be artisans' dwellings and so throw a welcome light on the housing of the lower classes in the third millennium. Each house-block is about 55 feet long and 23 feet wide with a cubicle in front beside the entrance, an open court in the middle and a single room 16 feet deep at the back. Yet in the courtyard of one of these tenements was found a hoard of superb gold ornaments, including inlays of remarkable technical refinement.

Indeed if the architectural remains from Harappa are uninspiring, the harvest of relics is very instructive. The pottery, seals, bronzes and other objects, from what the excavator terms the Late levels, for the most part duplicate these recovered at Mohenjo-daro, 450 odd miles away, and thus attest the extraordinary uniformity of the Indus civilization in its classical Harappa phase (to use Dr Mackay's terminology). Still, even here there are interesting local divergences. A vase in normal Harappa style and technique presents in addition to familiar motives an amusing group of human figures. The most popular toy vehicle of clay was not the long village cart so familiar in Sindh, but a light chariot which looks, as Mr Vats remarks, very like an inverted pack-saddle. There is also a fine bronze model of a covered car, unfortunately lacking wheels and here illustrated on too small a scale.

The puzzling thing at Harappa is that the relics from the lower levels are less, not more, like those from the southern sites. As the depth increases, 'tiny seals' predominate over the normal widespread forms. Though inscribed with the usual Indus characters, the tiny seals are really quite unlike anything common at Mohenjo-daro. The statistics here presented do not suffice to show whether there be any comparable divergence in pottery. The seals at least do not support anticipations of a widespread uniform culture undergoing local differentiation with the progress of time, but point if anything to a reverse process of assimilation.

Then Harappa has yielded remains of other cultures than that named after the site by Mackay. These are represented only by burials and stray pottery. To the Harappa culture itself are attributable the so-called 'post cremation burials' in urns. At one spot 54 such urns were found standing in a row 110 feet long, and 178 additional urns came to light in various parts of the ruins. Now of all these urns only one has ever yielded even the tiniest fragment of identifiably human bone! Their normal contents are small vases, figurines, toys, cakes, animal bones and ashes. So if the urns be funerary at all, the rite they attest has nothing whatsoever in common with that observed in Bronze Age urnfields in Europe.

ANTIQUITY

On the other hand the famous H cemetery, situated on comparatively low-lying ground at the southern foot of the great mounds, contains undoubted burials but not of the Harappa culture. Seals and similar articles are missing from these graves, and their funerary pottery is conspicuously different, technically and stylistically, from the standard Harappa wares. Sherds of this funerary pottery have indeed been found on the mounds too. But a statistical study of the stratigraphical position of these sherds shows that they must belong to late high levels. They and the burials in cemetery H presumably belong to a distinct culture whose authors occupied the site after its abandonment by the Harappa civilization proper. Nevertheless, though the art of the funerary pottery in its motives and composition is so strikingly different, survivals of the 'classical' tradition in technique, and to a small extent even in form, can be observed. Moreover the skulls from the lower H graves are said to agree with those from Harappa levels at Mohenjo-daro and Harappa itself. Only in an upper layer of interments could Dr Guha detect an 'admixture of a small low-headed race such as is seen among the present aboriginal population of India'. The lower layer in the cemetery comprises exclusively fractional interments accompanied by numerous vases. The fifty-seven graves in the upper layer consist of jars containing as a rule very incomplete skeletons without funerary furniture. The paintings on the jars and their covers—mostly peacocks and stars—agree fairly closely in subjects, style and technique with those decorating the varied assortment of forms accompanying the fractional burials in the lower level. Despite the anthropological divergence there can hardly be any great interval of time or tradition between the two sets of burials.

So the excavations at Harappa have raised fresh problems. There still remain large unexcavated areas which may provide clues to their solution. The reader gets the impression that in the light of experience gained the excavator might be still more successful in disentangling the fragmentary walls and planning the buildings. (Too much reliance has been placed, as at Mohenjo-daro, on arbitrary levels and too little on floors and streets). We may then hope that in time of peace operations will be resumed with fuller equipment.

In the meantime the historian of civilization is profoundly indebted to Mr Vats for his clear and scholarly report. The delay in its appearance cannot be regarded as at all excessive, especially when it be remembered that the author had to write his report in the intervals between his normal duties as Inspector and then as Deputy Director-General of Archaeology. His Department and the Government of India must be commended for producing the work so lavishly at so very modest a price. Of course I should have liked larger figures in many instances, but that would have raised the cost. The blocks, all made in India and including a coloured reproduction of a polychrome jar, show a high standard

REVIEWS

of workmanship. The reading is facilitated by good type and very helpful marginal headings. Appendices deal with technical subjects. Analyses of the bronzes by Dr Sana Ullah disclose in all samples both nickel and arsenic as impurities. He points out that precisely these elements occur in the Rajputana ores that may therefore very likely represent the source of the Indus copper. Mr Vats himself adds a note on relics from other prehistoric sites, including Rupar on the Sutlej, 200 miles east of Harappa. Though typical painted pottery and seals were not picked up at this remote spot, the relics figured can all be matched in the Harappa culture of which Rupar can thus be regarded as the furthest outpost.

V. GORDON CHILDE.

ANGLO-SAXON CHARTERS. *Edited by A. J. ROBERTSON. Cambridge University Press, 1939. pp. xxvii, 555. 25s.*

Miss Robertson explains in her preface that the present collection of texts, 135 in all, includes 'every kind of deed and record concerned with the transaction of legal business, apart from manumissions' preserved in Old English, with the exception of the documents printed in Miss Harmer's *Select English Historical Documents of the Ninth and Tenth Centuries* and Miss Whitelock's *Anglo-Saxon Wills*. The number of documents relating to the pre-Conquest period which can be used in editions conforming to the requirements of modern scholarship has thus materially increased. Nearly all the texts have been printed before, but of few can it be said that they have been previously edited. The footnotes to the texts reveal the care with which Miss Robertson has examined her manuscripts and she has provided translations and about 250 pages of valuable notes. It may certainly be said that, thanks chiefly to her, Miss Harmer and Miss Whitelock, the re-editing of historical documents in Old English is advancing with rapidity, and Professor Hazeltine observes that 'the present seems the appropriate time in which to begin the preparation of a new *Codex Diplomaticus* of all the charters and other documents in Latin'. The editor is here, however, confronted with a difficult problem, whether new work should be on the lines of Kemble and Birch, or should take in the first instance the form of adequate editions of certain ancient cartularies, in particular Hemming's Cartulary, the Textus Roffensis and the Codex Wintoniensis. Many of the documents in Miss Robertson's own volume are preserved in cartularies, and the proportion of documents derived from cartularies would be higher in the case of the Latin documents. A cartulary such as Hemming's has an intrinsic interest and value and something is lost if it is not treated as an organic whole.

Of the *corpus* of pre-Conquest 'charters' those in Old English form a comparatively small proportion. The period in which the vernacular was first

ANTIQUITY

used for drafting royal and private charters is a matter of some interest. The earliest royal diploma in Miss Harmer's *English Historical Documents* is that of Berhtwulf of Mercia, *c.* 845. Miss Robertson's collection includes two Mercian documents relating to the eighth century, but the first, a diploma of king Ethelbald belonging to 743-5, seems to be a late ninth century translation of a lost Latin charter, and the second is apparently a translation (probably also of the late ninth century) of the surviving Latin summary of a charter of king Offa. Excluding the late paraphrase of one of king Ethelwulf's diplomas (no. VIII) and the brief summary by a contemporary on the back of a charter of king Ethelbert (no. x), the grant of privileges by the latter king (860-66) to Sherborne (no. xi) is the earliest royal diploma issued in Old English in this collection, and there is no other example from the ninth century, unless the origin of king Ethelred's grant to the ealdorman Aelfstan (no. xii, *c.* 870) preserved in a Middle English version is a lost vernacular charter and not the Latin document which has survived. The royal diploma issued in the vernacular only was a rarity not only in the ninth century but also in the tenth and eleventh centuries. Some of the surviving examples are undoubtedly genuine, but others are spurious or open to suspicion. One, a grant of king Edgar to Sherborne (no. L), was presumably issued in circumstances which precluded the drafting of a more elaborate instrument—'I, king Edgar, declare in this book, which is a gospel book, that I have granted, etc.' From the early ninth century, testamentary dispositions were drawn up in the vernacular: Miss Robertson prints the earliest known documents of this type (lacking however 'the characteristic features of the Anglo-Saxon will' and therefore excluded from Miss Whitelock's volume), belonging to the first decade of the century. Memoranda concerning litigation, some of the most interesting documents in Miss Robertson's collection, likewise go back to the first half of the ninth century (nos. iv and v, Mercian). Unlike royal diplomas, 'private charters' (applying this term to grants, leases, agreements and exchanges) were frequently written in English. Miss Harmer edited the earliest grant, that of the ealdorman Oswulf issued at the opening of the ninth century. Leases begin in the third quarter of the ninth century and are more numerous in the tenth, documents of this class forming a large proportion of Miss Robertson's texts. It seems to have been a matter of indifference whether leases were drawn up in Latin or Anglo-Saxon, though those in the former language are more numerous. Of rather more general interest are the surveys, few in number but very precious, the list of estates liable for work on Rochester bridge (no. LII, of uncertain date) and the 'list of contributions of men required for manning a ship, *c.* 1000' (no. LXXII). In the small group of post-Conquest texts in the volume the editor has included an interesting but little known record of the dues rendered to the church at Lambourn in the late eleventh

REVIEWS

century (and probably much earlier); the student would welcome the discovery of more documents of this type.

It is a pleasure to find in this volume critical editions of the *Burghal Hidage* and the *Northamptonshire Geld Roll*, which have long been needed. With her text of *Burghal Hidage*, based on Laurence Nowell's transcript of the early eleventh century manuscript destroyed by fire, Miss Robertson prints the 'specifications regarding the maintenance and defence of fortifications' which occur only in that transcript and have so far been printed only in the *Dissertatio Epistolaris* of Hickes. These specifications seem to explain upon what principle round numbers of hides were allocated to the maintenance of the boroughs. 'For the maintenance and defence of an acre's breadth [i.e. 4 rods] of wall 16 hides are required. If every hide is represented by 1 man then every pole of wall can be manned by 4 men', and 160 hides are required to maintain one furlong of wall. It is shown in the notes that in some instances there is a close correspondence between the length of wall implied on this basis by the figures of the *Burghal Hidage* and the actual measurements where they can be ascertained with reasonable probability, as at Winchester, Wareham, Bath and Wallingford. The practice of discussing the document without reference to these 'specifications' has tended somewhat to obscure the significance of the arrangement for military purposes. Professor Tait's *Medieval English Borough*, containing a valuable discussion of the date of the document and a note that *Sceafstesige* 'has been located by Professor Stenton as an island in the Thames near Marlow' (pp. 15-18), probably appeared too late for any reference to be made to it in Miss Robertson's notes. Of the *Northamptonshire Geld Roll* she provides an accurate rendering which corrects the figures given by Round, who misunderstood the use of *healf* (in such phrases as *viii healf hide*, meaning seven and a half hides) in the entries relating to the hundreds of Upton Green, *Navereslund*, *Stotfalde*, Stoke and Corby. Not all the disparities between the items and the totals are removed by this revision, but the details for *Stotfalde* and Corby hundreds are now seen to be correct. Round assigned a roll to a date in or before 1075 because he identified 'the Lady' with queen Edith. Miss Robertson suggests that by 'the Lady' and 'the king's wife' the writer means queen Matilda, but there is no proof that the Conqueror's wife held queen Edith's manor in Corby hundred. The date of the roll is not much affected by this identification, for Osmund 'the king's writer' is almost certainly Osmund the chancellor and the roll cannot be later than 1078—after that date he would be described as 'bishop', even if he remained chancellor after his appointment to Salisbury.

The dating of the documents in this volume is often a matter of considerable difficulty, and it is clear that the editor has spent much time collecting all

ANTIQUITY

references to persons who occur in them. Occasionally it is necessary to make a careful study of all the notes to a charter in order to discover its probable date, and it may be urged that for the convenience of readers a date, tentative or certain, might have been attached to the brief heading which the editor devises for each document. The proportion of documents regarded as definitely spurious is very small, for the editor is reluctant to reject even a suspicious document if there is any good reason to suppose that it is a highly corrupt version of a genuine charter. Though in the past the authenticity of Latin and vernacular texts has often been too readily assumed, Miss Robertson's approach to the problem is undoubtedly the right one, and her remark that certain charters attributed to Cnut have been regarded with undue suspicion (p. 406) is justified. This edition has clearly taken many years to prepare, and it remains only to place on record our sense of gratitude to Miss Robertson for a book which will form an indispensable part of the historian's equipment. R. R. DARLINGTON.

FRUHBRONZEZEITLICHE KULTUREN IN UNGARN. By PAL VON PATAY. (Dissertationes Pannonicae ex Instituto numismatico et archaeologico Universitatis de Petro Pázmány nominatae Budapestinensis provenientes, 2nd ser. no. 13). *Buda Pest*, 1938. pp. 118, 13 plates and 14 maps. 30 pengő.

Even more than Ireland, Hungary has been a collectors' paradise; thence handsome bronzes and ornate pottery have been traded widely by dealers till they are scattered about in museums all over the world. So the Hungarian Bronze Age is familiar to every antiquary. But scientifically the period is even less well known in Hungary than in Ireland. A number of hoards have indeed been published and serve as a basis for typological division. But the very attractive and embarrassingly plentiful pottery is even harder than the Irish to fit into the chronological scheme thus provided. For before 1928 hardly any closed grave-groups had been published. Masses of sepulchral pottery and metal grave-goods were illustrated and exhibited as coming from cemeteries. These may of course have been used for many centuries, but most had been simply plundered, and even in the case of those excavated by local museums the grave-groups had been broken up. When Dr Banner of Szeged broke with this antiquated tradition and issued an analytical publication of the cemeteries on the lower Tisza and Maros, he could show that the graves covered several typological periods, and was able to allot the funerary pottery of the area between these. Along the Tisza too stratified settlements had been scientifically explored by Marton and Roska and had thus established a ceramic sequence. In 1928 I outlined a chronological scheme based on the four major cultural phases

REVIEWS

recognizable at Tószeg, lettered from the bottom up, and this was adopted but modified and improved by Dr Tompa in 1935.

The Tószeg sequence provided the chronological framework for the present study too, which really diverges from my scheme only verbally: von Patay, like Tompa, equates the Perjámos culture of the lower Tisza with that represented in Tószeg B on the upper Tisza, while I have taken Perjámos as representing a distinct culture parallel and akin to that represented in Tószeg A and B. He agrees with me that both are parallel to the classical Aunjetitz culture of Czechoslovakia and admits that on the lower Tisza no sharp distinction can be drawn between the finds of the Nagyrév (Tószeg A) and Perjámos phases. His lists show too that the Nagyrév and Tószeg B cultures on the upper Tisza are known exclusively from domestic sites, while on the Lower Tisza remains of the Perjámos culture are obtained from graves too. So even on the lower Tisza the Tószeg sequence can be applied only with modifications.

In the rest of Hungary it is more difficult, for the area was no cultural unit during the Bronze Age. In the central plain and west of the Danube it is still necessary both to establish the cultural sequence and to define the boundaries of the several cultures with the aid of accurate cartography. By plotting on ten maps the distribution of cultures assigned by him to the phases of Tószeg A and B and of the four Copper Age cultures that precede, von Patay has made a modest beginning in this indispensable task. The maps would be more convincing if individual traits—the several types of cinerary urn or pin—had been separately plotted instead of cultures defined principally by pooled ceramic types. As they are, the inclusion of isolated vases distinctive of one culture that turn up, perhaps as imports, in settlements or cemeteries belonging to another, is liable to confuse our impression of the boundaries between the several provinces.

Nevertheless the maps can be used to check the chronology advocated by von Patay and help us to understand the origins of the Bronze Age groups too. Exclusive distributions suggest graphically the contemporaneity of the groups named after Perjámos, Nagyrév, Kisapostag, Gáta and Magyarvarad (my Veselé type). The roots of these in the appropriate Copper Age cultures (Baden, Bell-beaker, Bodrogheresztur and Vučedol) are well brought out. Our author, however, would place also the urnfield cultures, characterized by 'Pannonian wares', in the period of Tószeg B and parallel to Perjámos. But his maps show an overlap of the North Pannonian variety into the provinces occupied during this phase by Gáta and Magyarvarad, while the stray finds along the Tisza are frankly derived from settlements and cemeteries of Tószeg C age. The argument for the earlier dating of this fabric is as follows: 'We know from this site a little cup that agrees accurately with the Moravian Aunjetitz

ANTIQUITY

type. A small jug recalling the Theiss type (of Perjámos) also came to light at the site. We can thus establish the contemporaneity of this culture with Aunjetitz and Perjámos'. But the site in question, Zsitvatö, is at best an urnfield (marked with a query in the author's list) from which a number of vases were collected last century. It cannot be admitted as a closed find proving the contemporaneity of anything.

Similarly the parallelism between the Vatia group of Pannonian urnfields and Perjámos or Tószeg B is deduced from early-looking bronzes and vases found in huge urnfields, one of which at Vatia comprised 364 graves and yielded also typical Tószeg C vases. The case for transferring the urnfield cultures from phase C to phase B is thus in all instances very weak.

The actual discussion of these urnfield cultures is none the less of great value. A link with earlier phases of local development in western Hungary is presumably afforded by the new Kisapostag group, here defined by the author, but pending the publication, promised in *Archaeologia Hungarica*, of the eponymous cemetery the group remains a little nebulous and the possibility remains that, as the original excavator thought, it should be put later. It is characterized in any case by cremation, and still earlier this rite was allegedly practised by the Bell-beaker folk round Buda Pest and some of the Baden people in the Copper Age. In the ceramic decoration the persistence of the traditions of Vučedol is obvious, but unfortunately the Vučedol culture itself cannot yet be elucidated by adequate material derived from systematic excavations, but is represented by stray sherds and stone implements. Von Patay has further been able to recognize in the pottery the influence of the Sudetic Tumulus Culture. But judging by the burial with a rapier at Vattina (not mentioned here) this influence must be due to an infusion of inhumationists from the north and was not decisive in the rise of the urnfield cultures.

These von Patay still presents as essentially autochthonous developments of Copper Age traditions. Their relation to the Lausitz culture of Poland and Germany and its provincial outposts in Bohemia and western Germany is not discussed. But some relation seems probable since, despite the contrast in the pottery, the funerary ritual agrees right down to the perforation of the urns' walls with 'ghost holes' in the Vatia group. On the other hand the potforms from the Vatia urnfields (like some from the inhumation graves of the Vattina culture to the east) really recall Aegean Minyan ware, and at Troy Minyan ware was found in an urnfield. These problems cannot be solved by abstract typological studies, but only by accurate plotting of distinctive types, analyses based on well-authenticated closed finds and scientific excavation and publication. Yet with their solution are bound up questions relating to the Illyrians, the Thracians, the Phrygians, the Hittites and even the Greeks!

REVIEWS

The book under review is to be welcomed as a preparatory step to the clarification of these problems. But without more closed finds and a keener appreciation of their value, the data for such a study are inadequate to provide anything like rigorous proof. I hope foreign authorities will not accept all the author's conclusions without criticism nor reproduce them again and again as 'von Patay has shown that . . .' We welcome too the enterprise of the Editor, Prof. Alföldi, in opening the pages of *Dissertationes Pannonicae*, hitherto devoted to Roman archaeology, to be vehicles for the publication of some of Hungary's stupendous wealth in prehistoric material. V. GORDON CHILDE.

CORPUS VASORUM ANTIQUORUM: U.S.A., Fascicule 7. The Robinson Collection, Baltimore, Md. By D. M. ROBINSON. *Harvard University Press*; London: *Oxford University Press*, 1938. pp. 62 and 44 plates. 22s 6d.

This is a most valuable collection of plates of vases and fragments, most of which have not previously been published. The plates are beautifully reproduced, and there is a full description of each piece with information about technique, and wherever possible parallels are given for comparison.

The majority of the vases are of the later fifth and fourth century, but there is one remarkable Black Figure by the Theseus painter; this has the unusual subject of a potter making a kiln, with a herm at his side. It is important as one of the earliest proofs of the existence of herms. Another uncommon Black Figure vase is of interest more for its shape than its decoration, being a spherical jug with a sieve in the bottom; no really satisfactory explanation of its purpose has been suggested.

Among the Attic Red Figure ware is a fine maenad kylix signed by the potter Hieron and painted by Makron; the drawing is free and spirited. The Pig painter is represented by a large column crater in excellent preservation, depicting a lively scene of youths and hetairai, though the subsidiary ornaments are of poor quality. There are some new toy oinochoes, of the type used by little boys at the spring Feast of the Jugs, and a hydria by the Meidias painter reminiscent of the British Museum hydria in its treatment of figures at varying levels, but with a more elaborate floral design which is unique. Of rather similar style is a hydria from the workshop of the Hippolytus painter, depicting a domestic scene of women at their toilet, while perhaps the most interesting of all is a large late Attic pelike of the so-called Kertch style by the Griffin painter, representing a fight between Amazons and Griffins. One of the Amazons rides a beautiful white horse, though the white paint which one would have expected to find on their faces is lacking.

ANTIQUITY

There are several Apulian red-figure vases, including examples by the new Hoppin painter created by Trendall, and the Tarporley painter. So far as can be judged from the reproductions, the workmanship is of no particular merit.

The collection includes a number of Campanian red-figure amphorae typical of the end of the fourth century, and three attractive Fish plates from Capua. One of them is by the Torpedo painter, and in each case Mr Robinson has not omitted to give us the species of the fish depicted. A curious three-bodied Lucanian vase suggestive of a cruet, and crudely decorated with birds and human heads, has a special painter, 'The Birder', invented for it by Trendall. Lastly there is a page of later Roman and Apulian rhytons and vases made in the shapes of animals and birds; one of them, a duck vase, comes from Benghazi—not its only link with the present, as one recognizes the same spirit in some of the articles displayed in our multiple stores today. E. SCOTT.

EXCAVATIONS AT OLYNTHUS. Part IX: The Chalcidic Mint and the Excavation Coins found in 1928–1934. By D. M. ROBINSON and P. A. CLEMENT. *Baltimore, The Johns Hopkins Press; London: Oxford University Press, 1938.* pp. xxxi, 413, 36 plates. £3 7s 6d.

This volume falls into two distinct parts, the first dealing with all the coins from the Chalcidic mint at Olynthus, and the second with the coins found actually on the site at Olynthus during the excavations undertaken in the years 1928–34.

The first 86 pages consist of a very full catalogue which describes in detail all the known gold and silver coins, from all parts of the world, issued by the Chalcidic mint at Olynthus. These are all of one type, showing a laureate head of Apollo on the obverse and a cithara on the reverse, and many of them are in an excellent state of preservation. From the similarity between them all and the close continuity of style Mr Robinson infers that the coinage was all issued from one single mint and not, as was previously supposed, from a group of confederate mints. He is able to establish the relative chronology of the coins by die couplings, style, fabric, and degrees of attrition of coins found in hoards; he finds four different types of punch die, the first confined to issues of tetrobols and hemiobols, which confirms the accepted theory that tetradrachms, were only minted at a later date. In many cases the dates can be fixed accurately by the symbols of different magistrates and engravers.

The numismatic evidence confirms that an independent Chalcidic state was in existence from 432 to 348 B.C. and all the coins were produced during that period. The varying prosperity of the state is clearly reflected in the issues of coins, and it appears that at times of crisis such as the early blockade of Potidaea, when the Chalcidians were badly in need of money, a great number of coins

REVIEWS

of low denominations were minted. After the peace of Nicias the growing prestige of the State and its increased commercial activity were shown by the change of the coin unit from the tetrobol to the tetradrachm, while the fact that the coins were used as models for the Macedonian royal mint indicates free circulation abroad. The mint continued increasingly active till the defeat of the Chalcidians by the Spartans in 379. After this the rate of production settled down to a much slower pace, increasing during the brief alliance with Philip, but sinking during the growing opposition to him, until in 348 he finally overcame and dissolved the State.

The second part of the book contains a catalogue of the coins found on the sites at Olynthus and Micyberna in 1934, followed by a commentary which embraces also the coins of the 1928 and 1931 excavations, and assigns revised dates to some of them.

There are nearly 4000 coins, many of them badly worn, coming from a wide range of places, including Attica and Persia; the majority however are from Macedonia and Thrace. The dates vary considerably, but 98 per cent. can be fixed at dates earlier than 348, while the others, which were all found in the north-west corner of the site, are almost all of the reign of Cassander. This points to the few remaining inhabitants having been displaced in 316 by the foundation of the new town of Cassandreia on the site of Potidaea.

The plates are clearly and admirably produced and do full justice to the beauty and fine workmanship of some of the Chalcidic tetradrachms.

E. SCOTT.

DIE STADTMAUER VON IZNIK (NICAEA). By A. F. SCHNEIDER and W. KARNAPP. *Berlin*, 1938. pp. 55, 52 plates, 22 figures in text. RM30.

The archaeological examination of the walls and monuments of Iznik undertaken by the Istanbul section of the German Archaeological Institute was begun in 1930 and continued at intervals until 1935. This volume (No. 9 of *Istanbuler Forschungen*) contains the report on the walls; that on the other remains, including the Islamic, awaits publication.

After a historical introduction and a short survey of records referring to the walls, left by travellers, beginning with Busbek and Dernschwam (1553-1555) a general description (by W. Karnapp) of style and technique of the building follows. Three main building periods are identified, and their characteristics noted (pp. 9-19). Next (pp. 19-36), gateways, towers and sections of the wall are treated in detail. The question of dating follows (pp. 36-43) and the conclusion is reached that the earliest remains are Hadrianic; that the first building period is Late-Antique, not Byzantine, as has been hitherto supposed; that the second building period began after the earthquake of 368, and repairs and

ANTIQUITY

additions continued to be made at intervals until 1204, when restoration on a large scale and the construction of a second wall, 13-16 m. in front of the main wall, and 3-4 m. high, was undertaken by the Lascarid Emperor, Theodore I. This is the third building period. The later history of the walls of Nicaea, which was finally lost to the Byzantines in 1330, is not included. A final chapter (pp. 43-53) contains a study of the pre-Islamic epigraphic material.

It is fortunate indeed that a careful study of these fine architectural relics has now been made and published, since the normal rate of their disintegration by nature is, we are told (p. 8), being quickened by the destructiveness of man.

Plans, drawings and photographs are on a most generous scale and of a very high standard. In the review copy, pl. 45 (referred to on p. 14) has somehow been omitted. On p. 21, line 2, for 'Tafel 7', read 'Tafel 8'. A few of the Greek accents are misprinted.

W. A. HEURTLEY.

BYZANTINE ART IN ROUMANIA. By MARCU BEZA. *Batsford*, 1940.
pp. xxi and 106, with 93 illustrations. 21s.

Mr Marcu Beza was for some years at Jerusalem as Consul-General of Roumania and he has visited many of the less familiar monasteries in the Near East. In the course of his travels he has collected photographs and paintings of a number of ecclesiastical objects which have been presented at various times to churches and monasteries by Moldo-Wallachian notables. His collection of photographs and paintings is published in this volume with an introduction and a jejune list, from which one gathers that the author was mainly interested in the objects not as works of art but as evidence of the wealth and piety of his fellow countrymen. The objects include altar-crosses in metal and wood, liturgical fans, reliquaries and caskets, book covers, icons, embroideries and illuminations; they date mostly from the 16th, 17th and 18th centuries. The title of the book, as the author hints in a disarming preface, is a misnomer—many of the objects are not Byzantine in style, none of them is now in Roumania and, with one or two exceptions, there is nothing to show that they were the work of Roumanian artists.

Sixty-eight photographs are reproduced and twenty-three paintings in colour, the latter including a portrait of the Archimandrite Kiriacos, Keeper of the Treasury in the Holy Sepulchre, and a view of the Vlasiu monastery on Mount Pindus. The photographs are good and have been well reproduced, but the paintings are not pleasing, but whether this is due to the character of the originals or the printing we cannot say.

J. W. CROWFOOT.